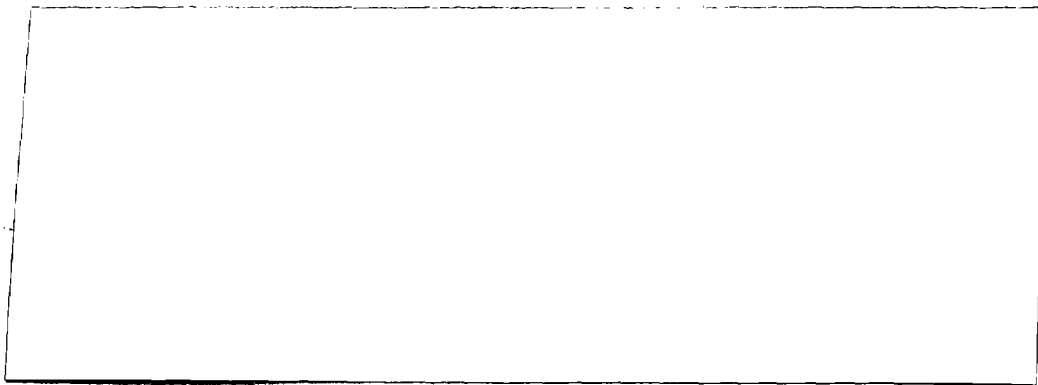


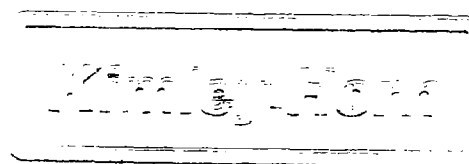
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**ST. LUCIE COUNTY BARRIER ISLAND STUDY
ANALYSIS OF
GROWTH MANAGEMENT POLICY PLAN**

Prepared for:

**Board of County Commissioners
St. Lucie County, Florida**

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August 1982

Preparation of this study was partially funded by the
Florida Department of Environmental Regulation and by the
Coastal Zone Management Act of 1972, as amended,
administered by the Office of Coastal Zone Management,
National Oceanic and Atmospheric Administration

HD75.8 .S25 1982

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CHAPTER I

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This report describes the analysis of the St. Lucie County Growth Management Policy Plan (GMPP) for the barrier islands as it relates to the public costs required to support planned development and to environmental constraints on development. Public costs associated with the growth include the costs of providing necessary transportation improvements, water and wastewater facilities, and police and fire protection. Environmental guidelines are provided to enable this growth to be accommodated with minimal environmental damage.

SUMMARY

The development permitted under the GMPP has extensive infrastructure costs associated with it, including the construction of a new bridge to the south island, two new overpasses at the Florida East Coast Railroad and widening of two existing two-lane bridges to the barrier islands. Because of these significant costs and possible environmental limitations on bridge construction or widening, two alternative growth levels have been analyzed in detail, based on potential transportation limitations. Three additional alternatives have been considered more generally as a result of workshops with the County Commission. The additional alternatives are discussed and all alternatives are compared in Appendix A. Alternative 1 is based on the maximum development that could be accommodated by widening existing bridges, but not including a new bridge. Alternative 2 is based on the maximum development that could be accommodated with the existing bridges, with some roadway improvements needed on the islands.

The GMPP would permit development of up to 41,957 dwelling units⁽¹⁾ on the islands, including 12,329 units on the north island, 7,255 in Fort Pierce, and 22,373 units on the remainder of the south island. Alternative Plan 1 would reduce the total by approximately 35 percent to 27,577, while Alternative Plan 2 would reduce total units to 20,392, a 50 percent reduction. Table I-1 shows the effect of the alternative growth plans on development in various parts of the barrier islands. The total units shown in each of the alternative plans were calculated based on the capacity of critical roadway links. In each case, the total number of units on the islands was maximized, subject to the critical intersection constraints, the distribution of development described in the GMPP, and the relative proportion of the various types of development (single-family, multi-family, transient). In Alternative 2, growth was only allocated north of the FP&L plant, in order to minimize the impact of trips across the Jensen Beach Causeway.

The level of infrastructure improvement required for the three plans differs widely. The total capital cost required for GMPP is \$79.70 million, including \$59.55 million for transportation improvements, \$16.25 million for water and sewer improvements, and \$3.90 million for police and

(1) Including transient dwelling units (hotels, motels, RV parks).

fire protection. These costs would be significantly lower for the reduced development plans: \$35.85 million for Alternative 1 and \$3.98 million for Alternative 2. The primary difference between the costs of the GMPP and the other plans is the construction of a \$31-million bridge to Hutchinson Island from near Midway Road. Table I-2 summarizes costs in each sector for each of the three plans.

TABLE I-1
SUMMARY OF DEVELOPMENT
(Dwelling Units, Including Transient)

Subarea	Existing and Approved	Uncommitted			Total		
		GMPP	A-1	A-2	GMPP	A-1	A-2
South of FP&L Plant	6,926	5,756	1,639	0	12,682	8,565	6,926
North of FP&L Plant*	1,022	8,669	2,235	843	9,691	3,257	1,865
Ft. Pierce	3,565	3,690	2,733	3,690	7,255	6,298	7,255
North Island	<u>3,546</u>	<u>8,783</u>	<u>5,911</u>	<u>800</u>	<u>12,329</u>	<u>9,457</u>	<u>4,346</u>
Total	15,059	26,898	12,518	5,333	41,957	27,577	20,392

* Unincorporated St. Lucie County

A-1 = Alternative 1
A-2 = Alternative 2

TABLE I-2
SUMMARY OF COSTS

Sub-area	Capital Costs (\$ millions)											
	Transportation			Water/Waste Water			Public Safety			Total		
	GMPP	A-1	A-2	GMPP	A-1	A-2	GMPP	A-1	A-2	GMPP	A-1	A-2
South Island (unincorporated)	46.35	9.21	0.81	9.85	7.00	---	2.44	1.23	1.17	58.64	17.44	1.98
Ft. Pierce	1.61	1.63	1.56	---	---	---	0.21	0.18	0.21	1.82	1.81	1.77
North Island	11.59	9.77	0.12	6.40	5.65	---	1.25	1.18	0.11	19.24	16.60	0.23
TOTAL	59.55	20.61	2.49	16.25	12.65	---	3.90	2.59	1.49	79.70	35.85	3.98

It is assumed that "local" resources will be required to pay for improved transportation, public safety, and water-sewer facilities needed to accommodate development above "existing and approved" levels. New development will generate additional revenues and benefits which will offset some portion of these costs to each impacted party. The primary existing source of revenue resulting from real estate development on the islands is ad valorem taxation. Property tax millage rates are applied to certified assessments of real property and personal property to determine annual tax revenues, which are then used to support general administration, public safety operations, the school board, public health facilities, the courts, and other miscellaneous revenue for special-purpose agencies such as the port authority, the fire district, erosion and mosquito control, and regional water management. As development occurs, one-time fees are imposed to cover the costs of issuing building permits and inspecting electrical, plumbing, and structural systems of new buildings.

Each development alternative has a potential revenue impact to the county or city. It is clear that under the GMPP and Alternative 1, the public investment needed to accommodate private development far exceeds the capacities of traditional, "in-place" funding vehicles such as capital budgeting and municipal bond financing. Additional means of raising capital, particularly for bridge improvements and sewerage facilities, will have to be implemented. To a large degree, the additional costs of the necessary public facilities will have to be borne by new and existing property owners who will benefit the most from the new facilities. Barring a substantial increase of state or federal money to assist with the construction of bridge improvements or sewerage facilities, it appears that special assessment districts and/or impact fees will be required on the islands to pay for the major portion of these improvements.

Preliminary calculations indicate that the GMPP could require additional special district levies of 0.6 to 0.8 mills to cover regional sewerage facilities. To provide for needed transportation improvements, impact fees of \$1,800 to \$1,900 per unit might be necessary. Alternative 1, by comparison, could entail levies of 0.8 to 1.0 mills and impact fees of \$1,100 to \$1,200 per unit. Alternative 2 would not require additional levies or impact fees.

The St. Lucie County Growth Management Policy Plan (GMPP) has significant implications for the environment and infrastructure of the barrier islands. This report suggests appropriate actions for the county concerning those growth implications. Because detailed site evaluation is necessary to determine the number of units that can be accommodated within environmental constraints, we have provided guidelines to be used in evaluating specific development proposals. More specific evaluation was concentrated on the GMPP's requirements for infrastructure (transportation, water, sewer, public safety) improvements needed to accommodate projected growth.

DEVELOPMENT GUIDELINES

As development continues on the barrier islands, the county will have to provide additional services as they are required. These additional public services may be provided in a timely and effective manner if the county establishes a uniform set of guidelines for development and uses these guidelines to coordinate provision of service with continuing development. Suggested development guidelines relating to transportation, water and sewer, public safety, and environmental concerns are given below.

Transportation

Because of the high cost of improving transportation facilities as well as the high cost of congestion in terms of time, fuel, and safety, it is extremely important that development be coordinated with planned transportation improvements. The existing site plan review process which can request traffic impact analyses should be revised to require impact analyses for all barrier island developments. Such analyses will be useful tools for determining the impact of each proposed development on the islands' transportation network.

The impact analyses should recognize the effect of each development on the existing and committed street network, using background traffic from existing plus approved developments. Because of the time delay between approval of a project and its implementation, less than 100 percent of approved project traffic should be added to existing traffic in computing background traffic. Palm Beach County, for example, uses existing plus fifty percent of approved project traffic to compute background traffic. As a guideline, if the street network is operating under capacity (Level of Service "D") with background traffic and would continue to provide at least Level of Service "D" with the addition of a new development's traffic, the development can be approved from a traffic standpoint. However, to prevent a few large developments from precluding all other development, only those projects or project phases adding traffic up to a specified percent of capacity (say, 20 percent) to roadways should be approved at one time. If a new development's traffic would increase the traffic to a point where the level of service would exceed Level of Service "D" for the combination of background and the new development's traffic, the project should not be approved without roadway improvements that would alleviate the capacity deficiencies. For a large development, it might be possible to approve the first phase of the project, with approval of the remaining phases contingent upon roadway improvements. During the approval process, the size of the project or project phase should be considered in terms of trips generated, as well as the impact on roadway capacity. For example, a project generating an insignificant number of trips (as defined by the county) might still be approved, even if the adjacent roadways are over capacity. If roadways to be affected by a project would be over capacity based only on background traffic, the project should be approved only if its traffic impact is insignificant, unless roadway improvements that would alleviate the capacity deficiencies are provided.

In addition to the approval requirements, an impact fee to pay for traffic improvements or street improvements in lieu of the fee could be required. Impact fees are discussed further in Chapter V.

The coordination of transportation improvements and development should be a two-way process. Only that amount of development whose traffic can be adequately accommodated on existing streets (plus committed improvements) should be approved. On the other hand, St. Lucie County should anticipate development occurring on the island and program the implementation of improvements to coincide with the increasing traffic demand caused by development, consistent with availability of adequate funding. Clearly, this process cannot always satisfy all parties involved; there must be give and take on both sides. Because of funding constraints, it may not always be possible for the county (or state) to provide transportation improvements as quickly as desired by developers. In such cases, it may be possible for the developer to assist in financing transportation improvements. (Methods of financing improvements are discussed in Chapter V.)

As discussed above, the timing of transportation improvements will be largely dependent upon the rate of development. Likewise, development will be constrained by the availability of certain key improvements. Table I-3 relates these items by sub-area. This table is to be used only as a rough guide. Detailed impact analysis will have to be conducted as development patterns emerge, as some areas may develop more rapidly than others. The table assumes that development occurs throughout the barrier islands in proportion to the remaining GMPP build-out units and that the type of units (single-family, multi-family, transient) develop in proportion to those remaining to be built. Variations from these development assumptions may cause significant changes to the threshold levels of development presented in the table.

Constraints to development in the Fort Pierce area are less severe than in the south island, where the traffic on Jensen Beach Causeway will nearly reach capacity with existing plus approved development. A stringent restriction or moratorium on development south of FP&L should continue until a decision is made and funding has been committed for improvement to the Jensen Beach Causeway and/or construction of a new bridge to the mainland. An environmental and economic feasibility study on such bridge improvements should be undertaken to determine what type of bridge improvements could be made. The environmental studies are critically important, as improvements to bridges may be beyond the control of the County. Construction permits must be obtained from the Florida Department of Environmental Regulation, the U.S. Army Corps of Engineers, and other agencies. If the decision is made not to improve or build those bridges, no further significant development should be allowed south of FP&L. If the improvements to be made are less than those required for full GMPP development, the GMPP should be modified to reflect the limitation on growth.

TABLE I-3
SEQUENCING OF DEVELOPMENT AND
MAJOR TRANSPORTATION IMPROVEMENTS

Sub-area I - South Island, South of FP&L (Zones S1, S2, S3)

6,926	Units, Existing plus Approved
+0	Available Capacity (Units)
<u>6,926</u>	
+1,639	Four-Lane Jensen Causeway
<u>8,565</u>	
+4,117	Construct New Four-Lane Bridge
<u>12,682</u>	Full Build-Out under GMPP

Sub-area II - South Island, North of FP&L (Zones S5, S6, S7)

1,022	Units, Existing plus Approved
+843	Available Capacity (Units)
<u>1,865</u>	
+1,392	Four-Lane Jensen Causeway
<u>3,257</u>	
+6,434	Construct New Four-Lane Bridge
<u>9,691</u>	Full Build-Out under GMPP

Sub-area III - Fort Pierce, on South Island (Zones FP1, FP2, FP3)

3,565	Units, Existing plus Approved
+3,690	Available Capacity (Units)
<u>7,255</u>	Full Build-Out under GMPP

Sub-area IV - North Island (Zones N1, N2, N3, N4)

3,546	Units, Existing plus Approved
+800	Available Capacity (Units)
<u>4,346</u>	
+5,106	Four-Lane North Bridge
<u>9,452</u>	
+2,877	Overpass at F.E.C. Railroad
<u>12,329</u>	Full Build-Out under GMPP

Water

Projects that will be constructed under the GMPP, or under Alternative 1 (no new bridge to serve South Hutchinson Island and no railroad overpass west of the North Bridge), should connect, initially or ultimately, to the existing water distribution system owned by North Hutchinson Services, Inc. (NHS) on the north island, or to the Fort Pierce Utilities Authority (FPUA) distribution system on the south island. Each project must be evaluated individually to determine whether, at the time project approval is requested, extension of the existing system or on-site plant construction is the more viable alternative. However, if it is determined by the applicant that the cost of line extension is prohibitive and that an on-site plant should be constructed initially, then an agreement for a contribution from the developer toward capital improvements for his prorata share of future line extension and associated improvements would be in order at the time the project is approved. Additionally, it should be agreed that once the line is extended and available for connection, then the project must discontinue use of the on-site plant and connect to the system which is owned either by NHS or the FPUA.

Projects that will be constructed under Alternative 2 (no new bridge or bridge improvements) should not be required to connect to the existing systems if the cost of line extensions is prohibitive as compared to the costs of an on-site plant to serve the project. The relatively low number of new units that can be built under Alternative Plan 2 (800 on North Hutchinson Island and 843 on South Hutchinson Island) and the uncertainty of the geographic distribution of those units demonstrate that future capital improvements to the distribution systems would be economically unrealistic and unlikely. Therefore, these projects would be served more economically by the construction, operation and maintenance of on-site plants, and attempts to require connection to the existing systems are discouraged.

Where it is determined that on-site water plant construction is the appropriate mechanism for meeting water supply demands, it is important that fire flow be provided. During the review process, it should be determined that the on-site plant being evaluated and furnished will supply fire flow at a rate and pressure and for a duration commensurate with the needs of the type of project being constructed. The system should be designed and constructed in accordance with criteria established by the St. Lucie County - Fort Pierce Fire District.

Wastewater

Projects that will be constructed under the GMPP or under Alternative 1 must connect, initially or ultimately, to the FPUA wastewater system (depending upon proximity) or to a new regional plant to serve either the north island or the south island. Projects lying close to the FPUA system could connect to it, but only with FPUA concurrence. It is more reasonable to believe, however, that it will be necessary to construct a new treatment plant and disposal system on both North and South Hutchinson Islands to serve those geographic areas. St. Lucie County must take the initiative in

developing this new system, as FPUA does not plan to extend its sewerage service beyond the Fort Pierce city limits. Since this utility is not available on either island, each project must currently provide its own on-site wastewater treatment and disposal facility. However, as in the case with the water system, agreement for a contribution by the developer should be made a part of project approval for his pro-rata share of future capital improvements for a regional wastewater transmission, treatment and disposal system. Similarly, as with the water system, it should be agreed that once the future system is constructed and available for use by that project, then the project must discontinue use of the on-site plant and connect to the new regional system.

Projects that will be constructed under Alternative 2 can be expected to provide their own on-site wastewater facilities for long-term use, just as in the case of the water system. Again, the few new units that can be built under this alternative and the unknown geographic distribution of those units indicates that the construction of regional plants on the islands to serve these units could not be justified economically for Alternative 2.

Public Safety

A new fire station currently planned for the south island will be able to serve that area's needs until the population north of FP&L (excluding Fort Pierce) reaches approximately 11,000 persons or 6,000 units. At that time, a new station should be built in that area, or the existing station in Ft. Pierce significantly expanded. A station should be built on the North Island when its population reaches 11,000 persons, or about 6,000 total units. This level of development would be reached under Alternative 1. The station would also be sufficient for full GMPP development. A police sub-station should be included in each new fire station as it is built. Personnel needs should be evaluated annually and personnel and equipment added as required to provide protection for the level of population and development on the islands.

An analysis of emergency evacuation showed that under the GMPP, evacuation from the north island would take 90 minutes (using the north bridge and SR A-1-A north) to 125 minutes (using the north bridge only), evacuation of the south island north of FP&L would take 120 minutes (using the south bridge and the mid-point bridge) and evacuation of the south island would take 200 minutes (using the Jensen Beach Causeway). Under Alternative 1, the evacuation times would be 80 to 95 minutes for the north island, 150 minutes for the south island north of FP&L, and 90 minutes for south of FP&L. Under Alternative 2, the times would be 65 minutes to 130 minutes for the north island, 145 minutes for the south island north of FP&L, and 210 minutes for the south island south of FP&L. These times were based on using three lanes of four-lane facilities, two lanes of three-lane facilities, and one lane of two-lane facilities for evacuation. Evacuation times also assume use of public safety personnel to direct traffic, enabling almost 100 percent utilization of available roadway capacity. In the event of hurricane evacuation, high waters or debris blocking State Road A-1-A and/or the Indian River Bridges would significantly lengthen

evacuation times. However, hurricane evacuation is being addressed in a separate study by the Treasure Coast Regional Planning Council.

Natural Environment

Natural communities of the St. Lucie County and Fort Pierce areas of the barrier islands can be generally characterized into three environmental zones typical of barrier islands on the east coast of Florida. The Beach and Dunelands Zone parallels the Atlantic Ocean, extending from the nearshore beach zone through the landward edge of the strand of the dune. The Upland Zone, dominated by scrubland and mixed hammock forest vegetation extends landward of the dunelands. The Marsh and Mangrove Zone encompasses extensive areas of lower elevation at the fringe of the Indian River estuary.

Each of the natural communities on the barrier islands exhibits characteristically different suitabilities and sensitivities to land use. Some are highly unstable and susceptible to change; others are particularly sensitive to disturbance. Most are valuable aesthetic and recreation resources.

Protection of the natural environments of the St. Lucie County and Fort Pierce areas of Hutchinson Island requires implementation of a comprehensive set of development guidelines designed to recognize the barrier islands' natural resources requiring protection, natural hazards, and natural limitations for development.

Development guidelines should be implemented for each of the major environmental zones on the islands. The nature of permitted uses, planning and design requirements, and required environmental protection measures during construction are described separately for the Beach and Duneland Zone, the Upland Area Zone, and the Marsh and Mangrove Forest Zone. In addition, specific requirements for surface water management, erosion and sedimentation control, and floodproofing and stormproofing should be implemented for all new development in all areas of the islands regardless of the environmental zone in which it occurs. Detailed development guidelines have been prepared for each of the above zones and general topics.

For each area, development guidelines are presented within the context of the objectives they are designed to realize, the growth management policies implicit in their use, and the basic administrative actions required at the local level to facilitate their implementation.

Preparation of the development guidelines and associated objectives, policies, and administrative recommendations has been based upon the existing local context of environmental protection. Local plans, policies, ordinances, and procedures have been incorporated to the extent possible, as have appropriate State and Federal procedures related to environmental protection.

Beach Access

Beach access appears adequate for existing development, but more public beach access points and associated public parking will be needed as the islands develop. The required dedication of public access ways by developers appears to be the most promising method of securing this access.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The analysis summarized above leads to the following conclusions:

- It is physically possible to provide an infrastructure to meet the needs of the GMPP.
- It is possible that environmental controls by agencies such as the Florida Department of Environmental Regulation and the U.S. Army Corps of Engineers could preclude the construction of a new bridge and/or widening of existing bridges.
- Based on the environmental review of the islands, it is unlikely that the maximum GMPP development will be realized if the recommended environmental guidelines are adopted.
- The infrastructure to serve all or most of the GMPP development is extensive and costly.
- Without Federal and/or State revenues for bridge improvements, impact fees of \$1,900 (GMPP) to \$1,100 (Alternative 1) per unit are likely to be required. Much of this impact revenue will be collected after the improvements are made, since all of the improvements will be needed long before full development of the islands occurs. Therefore, the County will be required to obtain funding through bonds or other sources and repay the obligations as impact fees are received.
- If the infrastructure cannot be constructed as identified in this report, a reduction in GMPP units must occur to prevent extreme congestion (Level of Service "E") in the transportation network.

Recommendations

Based upon the conclusions stated above, the following actions are recommended to the St. Lucie County Board of Commissioners:

- The county should commission an environmental study of the feasibility of constructing a new mid-point bridge and widening the existing north island bridge and the Jensen Beach causeway and bridge.
- If the bridge improvements are shown to be environmentally feasible, the county should seek a commitment for State funding for all or part of the bridge improvements.

- If sufficient State support is not forthcoming, the county should consider using new revenue sources to construct the needed improvements required by the growth permitted under the GMPP.
- If the decision is made to widen the existing two-lane bridges but not to construct a new mid-point bridge, the GMPP should be revised to allow only the level of impact specified under Alternative 1. State funding or additional local revenue sources will still be needed to construct the improvements required by this growth alternative.
- If the decision is made not to build a new mid-point bridge and not to widen the existing two-lane bridges, the GMPP should be revised to allow only the amount of impact specified under Alternative 2. The additional revenues derived from this reduced level of growth would be sufficient to cover the degree of improvements necessary.
- Regardless of the level of improvements to be made, it will be several years before any of the major improvements can be implemented. Therefore, the county must continue to monitor and limit growth in order to provide acceptable service to traffic and allow for emergency evacuation. Because of the low capacity of the Jensen Beach bridge and causeway, it is especially important that growth south of the FP&L plant be limited.
- The county should implement an impact review and evaluation system for evaluating the impact of each proposed development project on the infrastructure and environment.
- Development guidelines should be used to minimize adverse environmental consequences of development.

CHAPTER II

INTRODUCTION

The St. Lucie County Board of County Commissioners has been concerned over the ability of the St. Lucie County barrier islands to support both already approved development and ultimate development allowed under the Growth Management Policy Plan. Therefore, they retained a team of professionals to evaluate the impact of approved development and development under the Growth Management Policy Plan and identify any related problems in providing necessary services for these levels of development. The study identified funding required for the infrastructure improvements, including water and sewer services, transportation facilities, and public safety services including police, fire, emergency medical services, and evacuation. The study evaluated these improvements for different types and intensities of development. These analyses included alternatives to the level of development in the Growth Management Policy Plan. An analysis of the natural environment proposes guidelines to keep development compatible with the fragile environment of the barrier islands.

This report summarizes the inventories and analyses related to evaluating existing plus approved developments on both the north and south barrier islands in St. Lucie County, as reported in the Analysis of Existing plus Approved Development. This report also describes in detail the analysis of the impact of the development projected by the Growth Management Policy Plan on the islands and the infrastructure required to support that growth. Included are the itemized costs of implementing the infrastructure improvements, a revenue analysis, and an analysis of the impact of growth on the natural environment. Because of the major improvements to the infrastructure required by full development under the Growth Management Policy Plan (in particular, expensive new bridge construction and bridge widening), two alternative levels of development are included in the analysis. Under Alternative 1 existing bridges would be widened, but no new bridge would be built, while under Alternative 2, no bridge improvements would be made.

CHAPTER III

ANALYSIS OF FUTURE GROWTH POTENTIAL

This chapter describes the determination of units to be developed on the barrier islands under existing plus approved development, the Growth Management Policy Plan, and alternative levels of development. An analysis of buildable land was performed to determine the potential mix of single-family and multi-family units under ultimate development.

EXISTING AND APPROVED DEVELOPMENT

The first step of the study was to quantify existing and approved development on the barrier islands. Existing land use data were used to calibrate transportation and public safety models. Approved development was quantified to permit analysis of transportation, water and sewer, and public safety needs in the study area. The study areas are defined as the north and south barrier islands in St. Lucie County. Additional data were obtained in adjacent counties to facilitate transportation analyses.

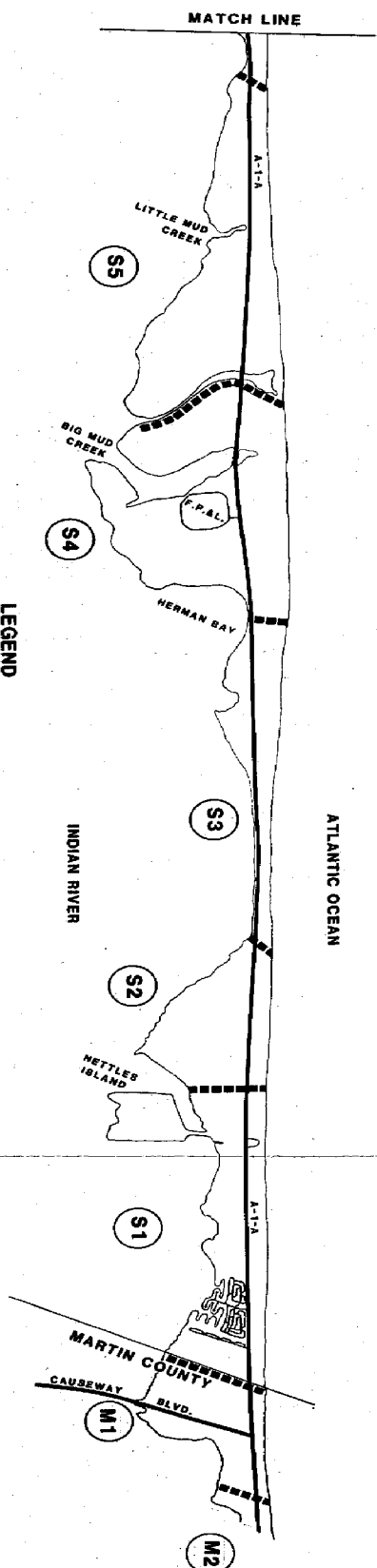
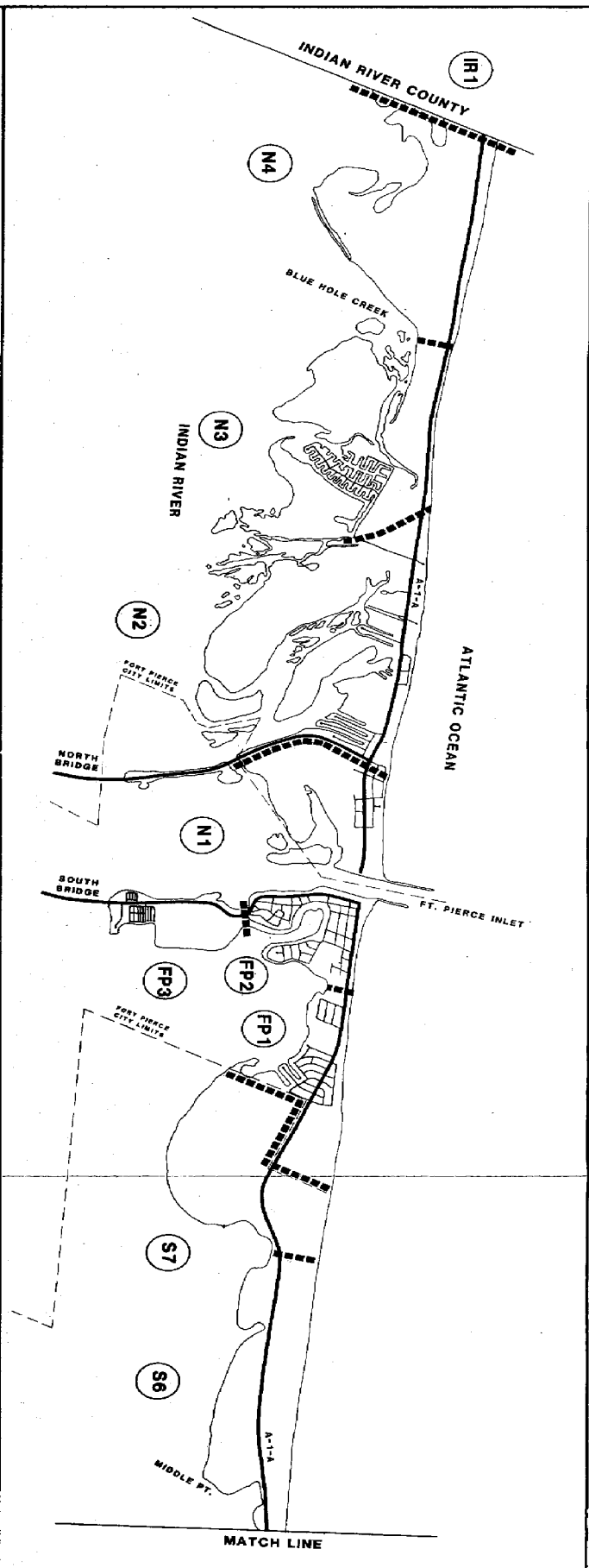
Existing and approved land use data were obtained for the barrier islands in Martin, St. Lucie and Indian River Counties. Data for the south island (Martin County and St. Lucie County) were provided by the Treasure Coast Regional Planning Council, St. Lucie County and the City of Fort Pierce. Inventory data for the north island (St. Lucie County and Indian River County) were provided by St. Lucie and Indian River Counties.

To develop analysis zones, the study team considered the distribution and type of existing land uses as well as future land use under the Growth Management Policy Plan. The study area and adjacent barrier islands were stratified into 17 separate zones. These zones are depicted on Figure III-1.

The portion of the south island located in Martin County was divided into two zones to assist in transportation analyses. Zone M1 includes the island from the county line to one mile south of the line. Zone M2 contains the remainder of the island in Martin County. Two zones have also been identified for Indian River County. These correspond to zones identified in the 1981 Indian River County Barrier Island Study.⁽¹⁾ Zone IR1 includes an area from the St. Lucie County line to just south of 17th Street. Zone IR2 extends from south of 17th Street to State Road 60. Areas north of Zone IR2 were not considered to significantly affect the study area.

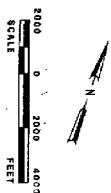
The location of each existing or approved residential development was identified along with the number and type of dwelling units included. These data were then aggregated by analysis zone. Table III-1 summarizes existing and approved residential development by analysis zone.

(1) Indian River County Barrier Island Study, Treasure Coast Regional Planning Commission, 1981.



■■■■■ ANALYSIS ZONE BOUNDARY
S3 ANALYSIS ZONE DESIGNATION

LEGEND



KIMLEY - HORN & ASSOCIATES, INC.
LINDA L. BROWNING, FERRARI &
HELISTON, INC.
WALLACE, ROBERTS, & TORD
HARRIS, SHER, GEORGE

ST. LUCIE COUNTY BARRIER ISLAND STUDY

ANALYSIS ZONES

FIGURE
III-1

TABLE III-1
EXISTING AND APPROVED DEVELOPMENT

Analysis Zone	Single-Family Units		Multi-Family Units		Recreation Vehicle Spaces		Hotel Rooms	
	E	A	E	A	E	A	E	A
M1	72	--	255	422	--	--	184	--
M2	13	420	1,170	1,705	--	--	--	--
Subtotal - Martin County	85	420	1,425	2,127	0	0	184	0
S1	129	48	1,177	797	2,608	--	119	--
S2	--	--	190	1,318	--	--	--	--
S3	--	--	203	337	--	--	--	--
S4	--	--	--	--	--	--	--	--
S5	--	--	--	--	--	--	--	--
S6	--	--	--	534	--	--	--	--
S7	--	--	--	488	--	--	--	--
Subtotal - St. Lucie County	129	48	1,570	3,474	2,608	0	119	0
FP1	150	--	1,142	668	--	--	--	--
FP2	213	--	635	388	--	--	103	--
FP3	--	--	266*	--	--	--	--	--
Subtotal - St. Pierce	363	0	2,043	1,056	0	0	103	0
TOTAL - SOUTH ISLAND	577	468	5,038	6,657	2,608	0	406	0
N1	177	--	109	--	--	--	--	--
N2	64	196	335	1,355	--	--	147	--
N3	--	--	--	513	400	--	--	--
N4	--	--	--	250	--	--	--	--
Subtotal - St. Lucie County	241	196	444	2,118	400	0	147	0
IR1	491	648	597	227	--	--	--	--
IR2	637	338	787	128	--	--	--	--
Subtotal - Indian River Co.	1,128	982	1,384	355	0	0	0	0
TOTAL - NORTH ISLAND	1,369	1,178	1,828	2,473	400	0	147	0

E = Existing
A = Approved
* = Mobile Homes

Non-residential development in the study area is minimal, and currently consists of several convenience food stores and restaurants. Small commercial areas also exist on Seaway Drive in Fort Pierce and on A-1-A in south Martin County near Indian River Plantation. One other small site has been approved for commercial development in St. Lucie County. A summary of commercial land use by analysis zone is provided in Table III-2.

TABLE III-2
EXISTING AND APPROVED COMMERCIAL LAND USE

<u>Analysis Zone</u>	<u>Existing</u>	<u>Approved</u>
M1 - M2	6.3 acres	12.4 acres
S1 - S7	5.5 acres	1.5 acres <u>±</u>
FP1 - FP2	9.7 acres	1.4 acres
N1 - N4	4.0 acres <u>±</u>	-0-
IR1 - IR2	63.0 acres <u>±</u>	-0-

ULTIMATE DEVELOPMENT

Growth Management Policy Plan

The development classifications of the St. Lucie County Growth Management Policy Plan (GMPP) and the City of Fort Pierce Comprehensive Plan were used to determine the extent of ultimate development on the barrier islands. The GMPP designates areas for various general land uses on the barrier islands, as well as for the rest of the county. Included for the barrier islands are the following designations:

- RL: low density residential (up to 5 units/acre)
- RM: medium density residential (up to 11 units/acre)
- RH: high density residential (up to 18 units/acre)
- CG: general commercial (retail, office, etc.)
- CT: tourist commercial (motels, restaurants, etc.)
- IU: industrial utilities (electrical generation, water, sewer, airports)
- OSR: open space recreation

In the City of Fort Pierce, the following designations apply:

RL: low density residential (up to 6.5 units/acre)
RM: medium density residential (up to 12 units/acre)
RH: high density residential (more than 12 units/acre)
CN: neighborhood commercial (grocery, barber, etc.)
CG: general commercial (department, conveniences, tourist, offices)
CC: light commercial (specialty retail)
CBD: CBD commercial
CO: offices, professional and business services
I: industrial
OS: general open space
OSC: conservation open space

The "ultimate development" of the barrier islands was determined by identifying the available uncommitted land in each zoning category and applying appropriate densities. For purposes of this analysis, uncommitted land was defined as all portions of the islands within the two jurisdictions not included in the following classifications:

- (1) Properties for which development rights have already been utilized (including areas of density transfer) for existing as well as approved development.
- (2) Land in public ownership (state- and city-owned properties, including those density transfer areas deeded to public ownership).
- (3) Land owned by Florida Power and Light Company.

The maximum number of new units on lands in St. Lucie County is regulated by allowable densities adopted in the GMPP. The manner in which the calculations are performed is specified in the Comprehensive Zoning Resolution. As stated in the Comprehensive Zoning Resolution, "density shall be computed only on lands which lie above the elevation of mean high water (MHW)."

Therefore, the maximum number of new units that may be constructed on uncommitted lands is determined by the following calculation:

$$\begin{array}{lcl} \text{Maximum Number} & = & \text{Land Lying Above} \times \text{Allowable} \\ \text{of New Units} & & \text{Mean High Water} \quad \text{Density} \\ & & \text{(acres)} \quad \text{(units per acre)} \end{array}$$

The regulations require that the determination of the amount of land lying above MHW be performed and certified by a registered land surveyor licensed to practice in Florida.

Substantial portions of the barrier islands lie within mosquito control impoundments, and land elevations within these impoundments have been found to be very close to the elevation of MHW. Subtle topographic changes in ground configuration and slope can affect large areas, placing them either above or below the elevation of MHW. Therefore, for precise determination

of the total number of units permitted on any parcel of uncommitted land, it is necessary to conduct a field survey to confirm the relationship between actual ground elevations and the elevation of MHW at that location.

Performing and providing topographic surveys of the entire barrier island system was beyond the scope of this study effort. However, in consultation with the county staff, it was determined that reasonable estimates of the amount of land lying above the elevation of MHW would be made by applying the results of certified topographic surveys performed on existing and approved projects to the uncommitted parcels. Therefore, the following procedures were used to estimate the amount of land lying above the elevation of MHW on all uncommitted parcels:

- All projects in the county files which required site plan approval and acreage certification of land above MHW were tabulated.
- The boundaries of the land committed to each project were plotted on aerial photographs (1" = 200') provided by the county, with the percentage of land above MHW shown on each.
- The percentage values identified for individual existing and approved projects were applied to the gross areas of uncommitted parcels which were deemed to be similar in character, yielding an estimate of the number of acres above MHW for each uncommitted parcel.
- The estimated maximum number of units permitted on each parcel was determined by multiplying the estimated number of acres lying above MHW by the allowable density under the GMPP for that parcel.

Thus, the "ultimate development" of the barrier islands was determined by adding the estimate of new units that could be build on uncommitted lands, as outlined above, to the number of existing and approved units.

Alternative Levels of Development

As discussed in Chapter I, the GMPP will require major bridge improvements that could be difficult to implement because of funding and/or environmental constraints. Therefore, two alternatives to the GMPP were evaluated to identify the level of development supportable under two conditions:

- "Alternative 1," in which estimates of ultimate development were made based upon the constraints that no new bridge would be constructed between the South Bridge and the Jensen Beach Bridge, and no railroad overpass would be constructed at the west end of the North Bridge.
- "Alternative 2," in which no new bridge nor any bridge improvements would be provided.

Ultimate development under the GMPP and the two alternatives is shown in Table III-3. The number of units shown for the GMPP and the two alternatives are not recommended quotas, but represent part of a wide range of allocations that could be accommodated under the constraints imposed by the transportation system and the natural environment.

The allocation of units within the City of Fort Pierce requires some explanation. Traffic generated by GMPP development could be accommodated at the intersection of Binney Drive and Seaway Drive, the critical intersection in the south bridge area, because northbound traffic from the southern part of the island would use the new mid-point bridge. Under Alternative 1, without the new bridge, all northbound traffic would use the south bridge, requiring the number of units in Fort Pierce to be reduced. However, because of the large reduction in units on the south end of the island under Alternative 2, northbound traffic was reduced sufficiently so that the number of units allocated for Fort Pierce did not have to be reduced.

TABLE III-3
ULTIMATE AND ALTERNATIVE DEVELOPMENT

GMPP ULTIMATE DEVELOPMENT

<u>Area</u>	<u>Unit Type</u>			<u>Total</u>
	<u>Single-Family</u>	<u>Multi-Family</u>	<u>RV, Hotel/Motel</u>	
North Island	3,172	8,310	847	12,329
South Island*				
North of FP&L	0	9,691	0	9,691
South of FP&L	177	8,234	4,271	12,682
Fort Pierce	576	6,487	192	7,255
Indian River County**	4,064	1,739	0	5,803
Martin County	1,388	4,387	184	5,959

ALTERNATIVE 1 DEVELOPMENT

<u>Area</u>	<u>Unit Type</u>			<u>Total</u>
	<u>Single-Family</u>	<u>Multi-Family</u>	<u>RV, Hotel/Motel</u>	
North Island	2,512	6,098	847	9,457
South Island*				
North of FP&L	0	3,257	0	3,257
South of FP&L	177	5,234	3,154	8,565
Fort Pierce	576	5,530	192	6,298
Indian River County**	4,064	1,739	0	5,803
Martin County	1,388	4,387	184	5,959

ALTERNATIVE 2 DEVELOPMENT

<u>Area</u>	<u>Unit Type</u>			<u>Total</u>
	<u>Single-Family</u>	<u>Multi-Family</u>	<u>RV, Hotel/Motel</u>	
North Island	620	3,179	547	4,346
South Island*				
North of FP&L	0	1,865	0	1,865
South of FP&L	177	4,022	2,727	6,926
Fort Pierce	576	6,487	192	7,255
Indian River County**	4,064	1,739	0	5,803
Martin County	1,388	4,387	184	5,959

* Unincorporated.

**Portion effecting study area.

Analysis of Buildable Land

The GMPP and City Comprehensive Plan indicate the maximum development potential for the islands; however, other factors must also be considered. In particular, not all of the land designated for a particular use can be fully developed. An environmental analysis was undertaken to determine whether the amount of developable land could accommodate the number of units allowed under the GMPP. It was determined that this growth could be accommodated on buildable land by using primarily multi-family development, within the net densities set by the GMPP.

This analysis had two primary purposes:

- (1) To determine the amount of undeveloped, uncommitted land (acres) that can reasonably be expected to be available for development given current Federal, State and local environmental controls.
- (2) To provide a baseline against which to evaluate building intensity required to accommodate alternative future growth allocations.

Land that can reasonably be expected to be available for development was defined as all uncommitted land not included within the following three categories:

- (1) Land located seaward of the established Coastal Construction Control Line as regulated under provisions of Section 161.052, Florida Statutes.*

It was assumed that no new construction, other than for shoreline protection and maintenance of existing structures, would be permitted seaward of the Coastal Construction Control Line.

- (2) Areas located west of State Road A-1-A included within the landward extent of State waters as defined in Section 17-4.01(17), Florida Administrative Code.*

It was assumed that current Florida Department of Environmental Regulation approach of not permitting placement of fill in State waters west of State Road A-1-A would continue. Consequently, for purposes of the developable land analysis, no areas of State waters (including marsh and mangrove swamps) west of State Road A-1-A were assumed available for development.

* Land within these three categories located landward of the mean high water line was used to determine total units permitted under existing plans. It was assumed, however, that the density allocated to these areas would be transferred to adjacent upland areas not constrained by environmental conditions.

- (3) Ninety-five percent of the areas located east of State Road A-1-A included within the landward extent of State waters as defined in Section 17-4.01(17), Florida Administrative Code.*

It was assumed that unofficial current Department of Environmental Regulation approach permitting placement of fill in one to five percent of State waters east of State Road A-1-A would continue. For purposes of the developable land analysis the maximum permitted area (five percent) of State waters (including marsh and mangrove swamp areas) was assumed available for development.

Results of this analysis are presented in Table III-4 for each of the 14 analysis zones in the Fort Pierce and St. Lucie County portions of the barrier islands. These are summarized as follows:

I. South island, south of FP&L:	164.2 acres
II. South island, north of FP&L:	172.9 acres
III. Ft. Pierce, on south island:	179.9 acres
IV. North island:	538.4 acres
TOTAL	<u>1,055.4 acres</u>

These results are based upon available data describing the type and areal extent of specific vegetative cover types; these were used to define the landward extent of State waters on the islands. As such, they do not reflect detailed site investigations on specific parcels. Such site surveys would provide more accurate designations of both developable and non-developable areas and could result in minor adjustments in the total developable area on the islands.

Data on net developable lands were used to help assess potential dwelling unit types in the various analysis zones. Considering the number of permittable units, the limited available net buildable acreage, and land costs, most of the St. Lucie County barrier island development will be multi-family units. Some single-family units can be developed in Fort Pierce and Zone N-1, reflecting basically the in-filling of vacant single-family lots. Net densities are low in Zone N-4 and single-family development is, therefore, likely to occur there. However, limitations on buildable acreage and land costs strongly suggest that multi-family development will occur in the remaining areas of the barrier islands. This development could accommodate the total number of units allowed under the GMPP.

* See Footnote on page III-8.

TABLE III-4

UNCOMMITTED LAND REASONABLY EXPECTED TO BE
AVAILABLE FOR DEVELOPMENT

Traffic Zone		Uncommitted Area Landward of the Coastal Construction Control Line Not Defined as an Area of State Waters (1)		Five Percent of the Uncommitted Area Defined as an Area of State Waters(1)(2)		Total Uncommitted Land Reasonably Expected to be Available for Development (acres)
Traffic Zone Designation	Land Use Classification	West SR A1A (acres)	East SR A1A (acres)	West SR A1A (acres)	East SR A1A (acres)	
S1	RL	--	--	--	--	--
	RM	26.6	--	--	--	26.6
	CT	14.6	9.8	--	--	24.4
S2	RL	11.2	--	--	--	11.2
	RM	15.0	20.8	--	--	35.8
S3	RL	15.7	--	--	--	15.7
	RM	--	17.1	1.3	--	18.4
	RH	1.1	31.0	--	--	32.1
S4	IU	--	--	--	--	--
S5	RL	19.9	35.9	2.7	--	58.5
	RM	--	48.9	0.1	--	49.0
	IU	--	--	--	--	--
S6	RL	1.2	--	--	--	1.2
	RM	--	27.0	11.1	--	38.1
S7	RL	12.1	--	--	--	12.1
	RM	--	9.2	1.8	--	11.0
	CG	--	1.4	1.6	--	3.0

TABLE III-4 (CONTINUED)

Traffic Zone Designation	Traffic Zone Land Use Classification	Uncommitted Area Landward of the Coastal Construction Control Line Not Defined as an Area of State Waters (1)		Five Percent of the Uncommitted Area Defined as an Area of State Waters (1)(2)		Total Uncommitted Land Reasonably Expected to be Available for Development (acres)
		West SR A1A (acres)	East SR A1A (acres)	West SR A1A (acres)	East SR A1A (acres)	
FP1		28.9	--	--	--	28.9
FP2		34.4	--	--	--	34.4
FP3		116.6	--	--	--	116.6
N1	RL	--	13.3	--	--	13.3
	RM	--	16.8	--	--	16.8
	OSR	--	--	--	--	--
N2	RL	25.3	--	--	--	25.3
	RM	55.9	38.3	--	--	94.2
	OSR	--	--	--	--	--
N3	RL	26.7	--	--	--	26.7
	RM	--	3.6	--	--	3.6
	RH	10.7	3.6	--	--	14.3
	CT	6.5	--	--	--	6.5
N4	RL	306.5	31.2	--	--	337.7

(1) See Section 17-4.01(17), Florida Administrative Code.

(2) Assuming current Florida Department of Environmental Regulation approach.

CHAPTER IV

TRANSPORTATION NEEDS AND COSTS

This chapter describes the projection of traffic volumes for existing plus approved development, GMPP development, and two alternative levels of development. Transportation needs and their costs are described for the GMPP and the alternative levels of development.

INVENTORY

An extensive inventory of traffic and roadway characteristics was conducted to identify existing peak season conditions. Twenty-four hour machine counts were made throughout the study area. Many of these counts were obtained by direction in order to determine existing peak hour characteristics. Directional hourly counts were made immediately north and south of the Florida Power and Light power plant in order to identify peak work trips associated with this facility. Quarterly counts for 1981 were obtained from the Florida Department of Transportation.

Peak hour intersection turning movements were obtained for the afternoon peak hour at major intersections within the study area. Existing intersection geometrics and bridge and roadway cross sections were inventoried for use in capacity calculations.

TRIP GENERATION

An extensive trip generation and distribution study was conducted to determine the trip generation and distribution characteristics of potential development on the St. Lucie County barrier islands. Data were collected in cooperation with St. Lucie County and City of Fort Pierce staff during the Winter of 1982 to obtain maximum occupancy conditions. A field review was conducted to determine the various types of development on the island and to identify those locations where accurate traffic counts could be obtained. A total of 12 sites were identified for inclusion in the study. These include three developments in Martin County, eight developments in St. Lucie County and one development in Indian River County. Data were obtained for both the north and south islands in St. Lucie County as well as for a mixture of dwelling unit types, including high-rise and low-rise multi-family units, single-family developments, a recreational vehicle development, and a motel. The traffic counts for each development were divided by the estimated number of occupied units for the development to provide an estimate of the number of trips generated per dwelling unit, or the trip generation rate. The rates for similar types of development were compared with each other and with the standard rates published by the Institute of Transportation Engineers (ITE) to determine the trip generation rates most appropriate for the St. Lucie County barrier islands.

The trip generation rates applicable to the study area are summarized in Table IV-I. These rates are based on the limited existing trip end

opportunities on the islands. Currently, it is estimated that an average of 10 percent of the trips generated remain on the island and 90 percent cross the Indian River Bridges or the Indian River County line.

TABLE IV-1
SUMMARY OF TRIP GENERATION RATES

<u>Land Use</u>	<u>Daily Trip Rate</u>
High-rise residential	3.5 per occupied dwelling unit
Single-family and low-rise residential	7.5 per occupied dwelling unit
Motel/Hotel	10.5 per occupied room*
Recreation vehicle park	3.5 per occupied space

*The high trip rate for motel/hotel units includes trips attracted to motel restaurants, lounges, and other facilities.

Although only a limited amount of new commercial development is currently approved on the islands, there will be significant pressure for such developments given the total development under the Growth Management Policy Plan (GMPP). The actual amount of commercial development will be constrained by land costs and the seasonal nature of the barrier island population. An estimated total of approximately 400,000 square feet of commercial/business facilities will be developed on the islands. These facilities will be distributed on the islands to generally serve commercial and neighborhood shopping and service needs. An average trip generation rate of 75 trips per 1,000 square feet was applied to the commercial floor area. This results in a total trip generation of 30,000 trips per day. Considering the ultimate development levels, this represents 0.75 trips per unit. Although the presence of increased commercial development on the islands could reduce the actual trips per unit crossing the Indian River bridges, the reduction is not expected to be significant because of the relatively low existing rates. Thus, 0.75 trip per unit was added to the trip rates noted in Table IV-1.

TRIP DISTRIBUTION AND ASSIGNMENT

Calibration

In addition to generation data, travel distribution data for existing development were obtained. The results of the trip generation study and distribution data appeared reasonable when compared with Institute of Transportation Engineers trip generation standards and existing attractions. However, before using these models to analyze approved development or the GMPP's "ultimate development," they were applied to existing development to provide an additional validity check. The accuracy of the modeling was checked by comparing synthesized traffic volumes to actual existing ground counts. Trips from existing development were generated and distributed based on the data presented in the previous section and observed occupancy rates.

Synthesized traffic was compared to ground counts at the bridge crossings and along six points on roads in the study area. In general, the synthesized volumes for the bridge crossings were lower than the actual ground counts, as expected because of beach trips and construction traffic, which were not included in the generation and distribution models. Synthesized volumes on island roads agreed very closely with actual ground counts. The actual differentials between synthesized traffic and ground counts on the various bridges appeared to correspond well with reasonable levels of beach and construction traffic. The close comparison of assigned and existing volumes clearly validated the generation and distribution models.

Existing Plus Approved Development

The directional distribution data gathered in the generation study were used to estimate directional distribution and assignment for each analysis zone. Distribution percentages for zones that are currently void of development were based on interpolation between zones for which data were available. Table IV-2 summarizes the directional distribution by zone.

Approved development traffic was then generated, distributed and assigned to the network based upon the models developed in the calibration stage of the study. Daily traffic volumes were converted to peak hour volumes at the critical intersections. The basis for converting daily traffic to peak hour traffic is listed below:

- 8.5 percent of the combined existing plus approved daily traffic occurs in the PM peak hour.
- Directional split is the same as base year traffic directional split.

Existing traffic was adjusted to reflect traffic reduction due to completion of the FP&L power plant. Existing and approved development traffic volumes, daily and peak hour, are shown on Figure IV-1.

GMPP Analysis

Traffic generated by the GMPP development was distributed considering the general north-south distribution exhibited by existing development and the effects of proposed new mainland trip end opportunities in Martin and St. Lucie Counties. Trips leaving the island were assigned to the island networks based on the mainland destinations and the shortest travel time path. Capacity requirements dictated the need for a new bridge between the existing south island bridges. Thus the new facility was also included in the network.

TABLE IV-2
EXISTING TRAVEL DISTRIBUTION SUMMARY

<u>Analysis Zone</u>	<u>Percent North</u>	<u>Percent South</u>
M2	15	85
M1	40	60
S1	20	80
S2	20	80
S3	30	70
S4	50	50
S5	60	40
S6	70	30
S7	80	20
FP1	85	15
FP2	90	10
FP3	90	10
N1	10	90*
N2	20	80
N3	35	65
N4	45	55
IR1	80	20
IR2	90	10

* = Percent West

Trips were also distributed to on-island commercial attractions and assigned to the islands' roadway network. These were assumed to be five commercial locations, averaging 80,000 square feet in gross leasable area.

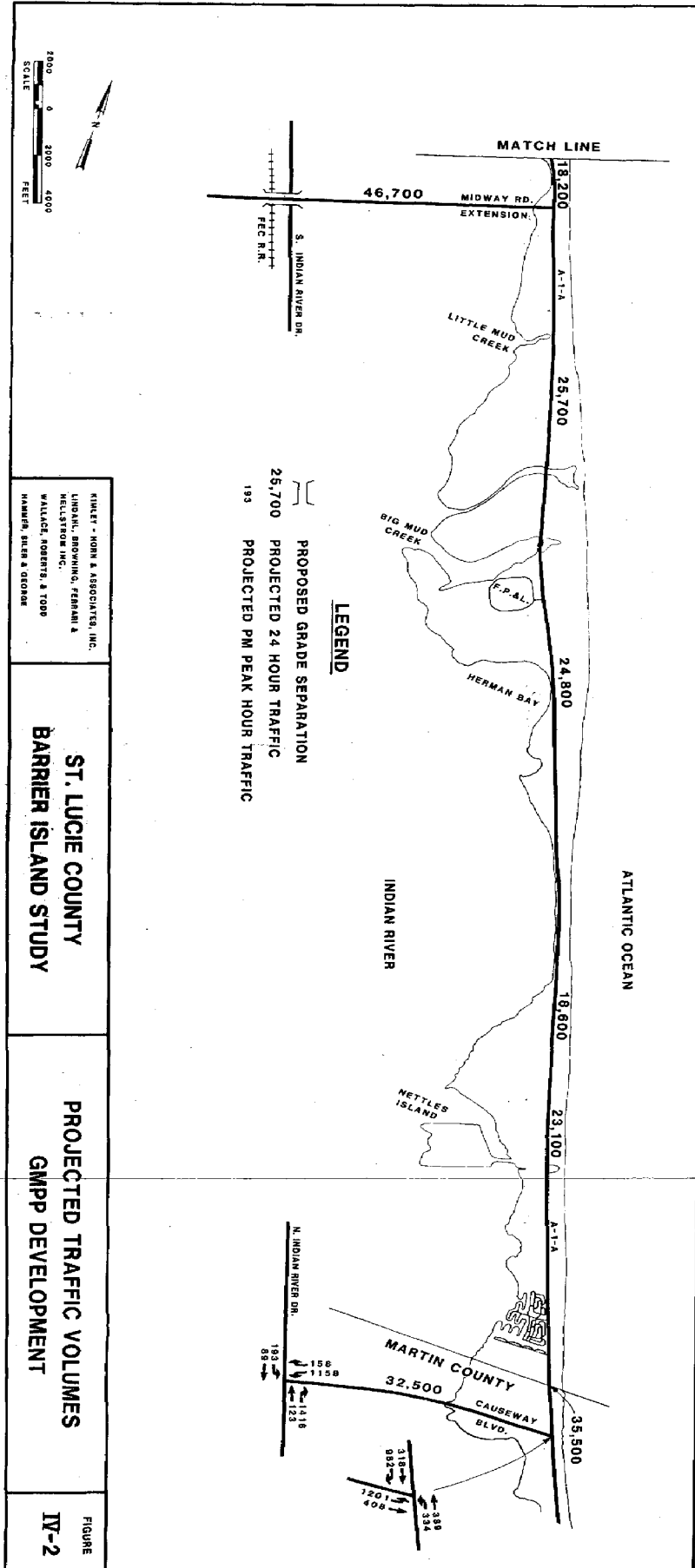
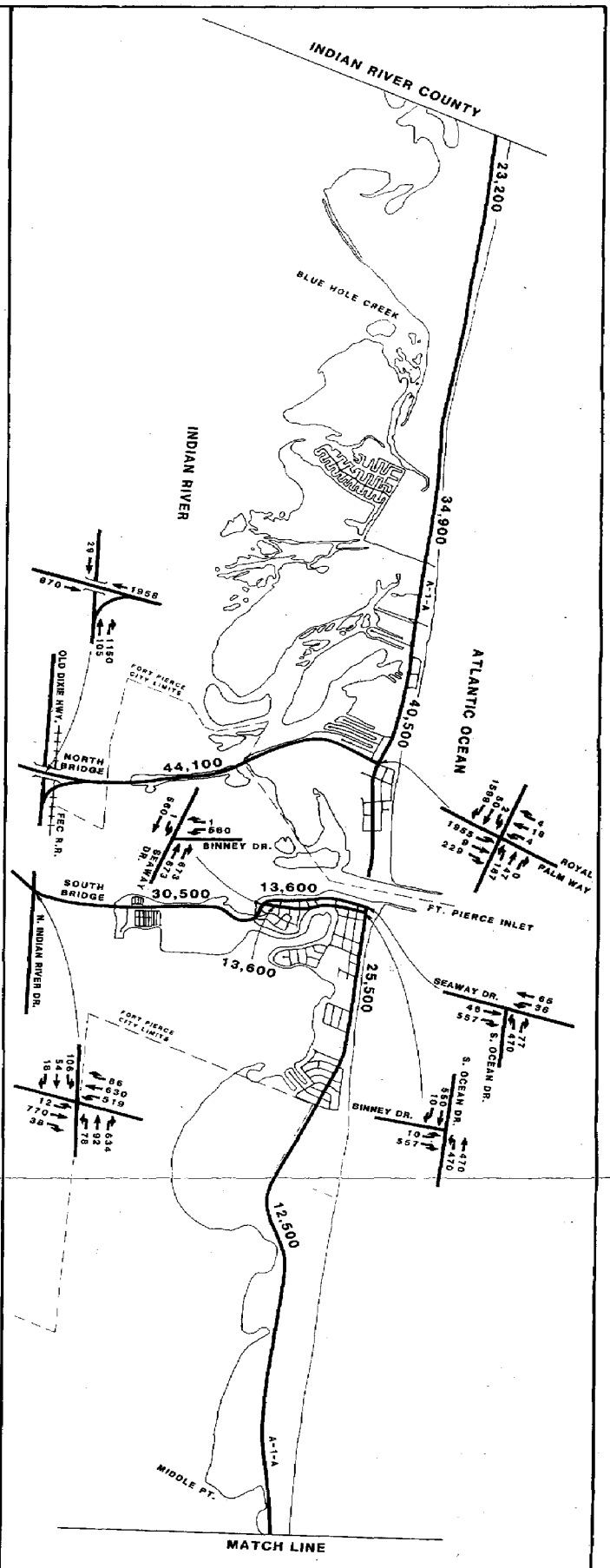
Trips attracted to public beach areas from the mainland were assigned to the North Bridge, South Bridge, and Jensen Beach Causeway. A detailed analysis of beach trips was beyond the scope of this study, but based on existing facilities, estimates of existing beach travel and projected population growth for St. Lucie County, provision was made for up to 2,000 trips daily per bridge (6,000 total trips) attracted to the beach daily during the peak season.

Peak hour volume as a percentage of daily volume varies with dwelling unit type and other factors. Daily volumes were converted to peak hour volumes based on 9.0 percent of the daily traffic volume occurring in the peak hour, 55 percent/45 percent directional split. (NOTE: A slightly higher peak hour percentage is anticipated at build-out of the GMPP than under existing plus approved conditions.) Total GMPP traffic volumes, daily and peak hour, are shown on Figure IV-2.

GMPP traffic was assigned to a network with the new bridge at three alternative locations:

- Midway Road
- Two miles south of Midway Road
- Walton Road

Based on cost, service to traffic and environmental constraints, the Midway bridge alternative was used in developing final traffic assignments and cost estimates. The Midway Road location is desirable since it does not cross environmentally sensitive areas and aligns with an existing roadway which can be widened to provide necessary capacity. One negative factor of this location, however, is that its location would require the construction of bridge structure all the way to State Road A-1-A to avoid environmentally sensitive land. Further, the intersection of Midway Road and State Road A-1-A would be relatively close to a potential breach area. The location south of Midway Road would be in a less environmentally sensitive area, however, its connection at Indian River Drive would be at a "T" intersection requiring all traffic to turn and divert to Midway Road to the north or Walton Road to the south. This is an undesirable characteristic considering the high volumes of traffic which would be using this crossing. Further, this more southerly location would increase the traffic demands on the roadway network in the City of Fort Pierce. The Walton Road location would be advantageous as it would minimize the traffic demands on the Jensen Causeway crossing. However, it would significantly increase the traffic burden on the roadway system in Fort Pierce. Furthermore, it would be necessary to bridge the Savannahs' environmentally sensitive area since adequate right-of-way does not exist through this area.



A detailed feasibility analysis of the alternative bridge locations is not a part of this study. It should be pointed out, however, that if the actual location of the new bridge is south of Midway Road, the impact on Seaway and Binney Drives in Fort Pierce will increase, and capacity deficiencies can be expected at full development of the GMPP.

Alternatives Analysis

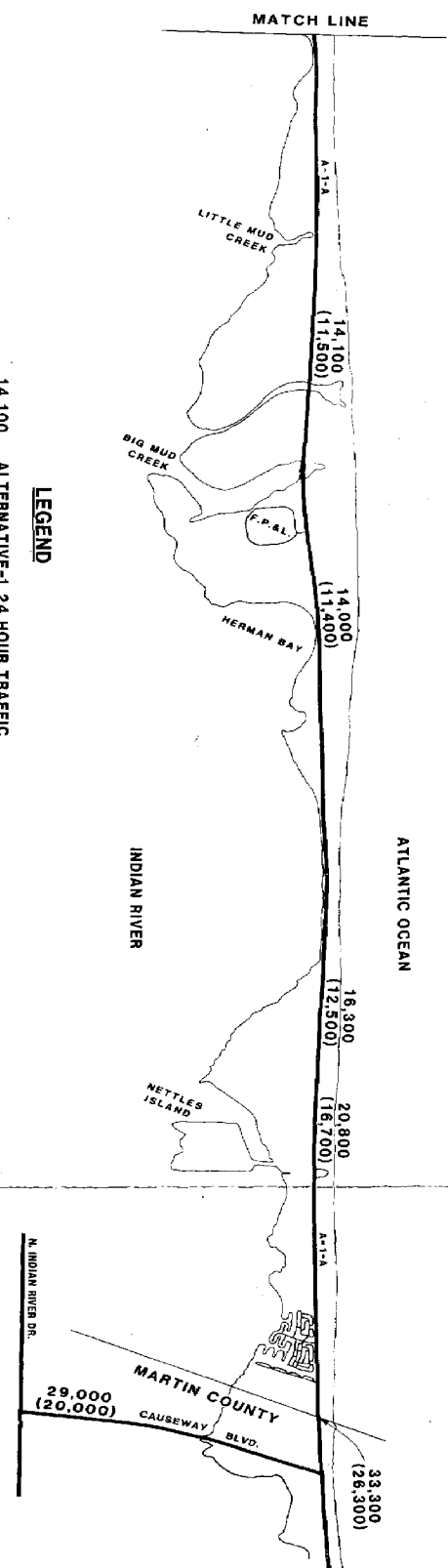
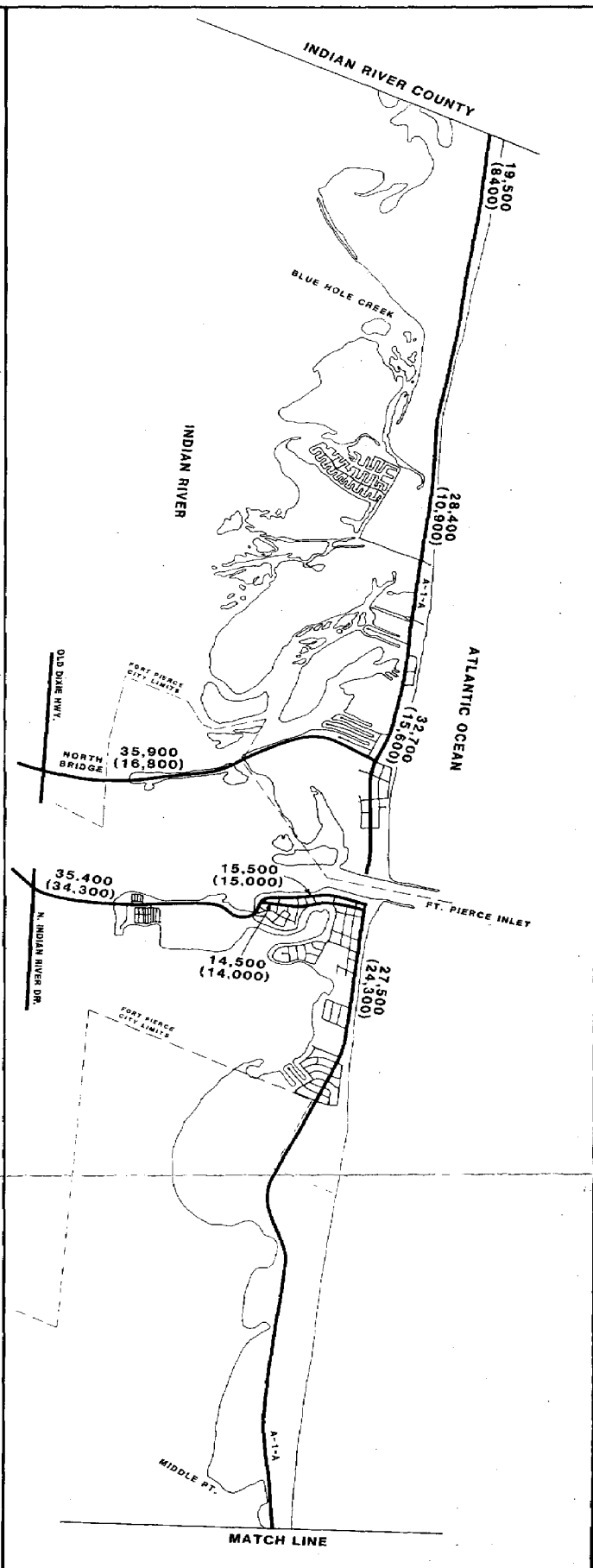
Because of the high cost and environmental constraints of the major roadway improvements required by full GMPP development, alternative development levels were analyzed under which lower levels of transportation improvements would be acceptable. Alternative 1 would permit development up to the point that a new bridge would be required, while Alternative 2 would permit only that development that could be accommodated on the existing bridges, without widening.

Traffic for levels of development under Alternatives 1 and 2 was also assigned to the transportation network. These two assignments were actually performed interactively, using the capacity of critical network links to determine the level of development under each scenario. The intersection of the North Bridge at Old Dixie Highway controlled development on the north island, the intersection of Seaway Drive and Binney Drive constrained development on the south island north of the FP&L plant. The intersection of the Jensen Beach Causeway at SR A-1-A controlled development primarily south of the FPL plant. Because of the interaction between traffic on the entire south island and the two bridges, development in both portions of the island was limited in such a way as to maximize the total number of uncommitted units that could be developed, given the traffic constraints. Daily traffic volumes projected for Alternatives 1 and 2 are shown on Figure IV-3.

NEEDS ANALYSIS

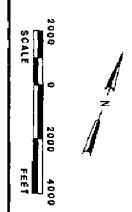
To assess the ability of the existing system to accommodate future development, capacity analyses were performed for major roadway links, as well as critical intersections in the study area. Daily capacity volumes were developed based upon the 1965 Highway Capacity Manual and capacity estimates provided by the Florida Department of Transportation in its report, Analysis of Hutchinson Island Traffic, dated April 19, 1982. These were developed to reflect the actual peak hour conditions projected for existing and committed development.

Peak hour capacities were determined at major intersections in the study area, based upon Transportation Research Circular 212, Interim Materials on Highway Capacity. The results of the analyses are shown in Table IV-3. This table reflects the level of service provided at major intersections and on critical links of existing roads in the study area.



LEGEND

14,100 ALTERNATIVE-1 24 HOUR TRAFFIC
(11,500) ALTERNATIVE-2 24 HOUR TRAFFIC



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**PROJECTED TRAFFIC VOLUMES
ALTERNATIVES 1 AND 2 DEVELOPMENT**

**FIGURE
IV-3**

TABLE IV-3
EXISTING CAPACITY ANALYSIS SUMMARY

Link	Existing Plus Approved Volume	Capacity		Level of Service
		C**	D**	
<u>North Bridge</u>				
LINK	15,300	15,600	17,600	C
@ Old Dixie Highway Intersection		16,600	18,900	C
@ Royal Palm Way Intersection		15,000*	17,000*	D
<u>Fort Pierce (South) Bridge</u>				
LINK	22,700	58,900	66,200	A
@ Indian River Drive Intersection		36,000	40,500	A
@ Binney Drive Intersection		27,600	31,100	A
<u>Binney Drive west of Seaway Drive</u>				
LINK	9,300	18,800	21,200	A
@ Seaway Drive Intersection		12,900	14,500	A
<u>Seaway Drive west of Binney Drive</u>				
LINK	10,600	18,800	21,200	A
@ Binney Drive Intersection		13,800	15,500	A
<u>A-1-A south of Binney Drive</u>				
LINK	15,800	18,800	21,200	B
@ Binney Drive Intersection		13,600*	15,200*	E
<u>Jensen Beach Causeway</u>				
LINK	17,000	15,600	17,600	D
@ A-1-A Intersection		17,900*	20,000*	C
@ Indian River Drive Intersection		13,100	14,700*	E
<u>A-1-A north of Jensen Causeway</u>				
LINK	22,300	18,800	21,200	E
@ Jensen Causeway Intersection		23,200*	26,200*	C

*Assumes signalization.

**Level-of-Service.

Capacities are shown in the table for Levels of Service "C" and "D". Level of Service "C" is generally used as the design level of service. However, in many areas it has been recognized as too costly or infeasible altogether to provide this level, and Level of Service "D" has been adopted as a compromise between convenience and economics. To enable the readers to better understand the meanings of levels of service, the following brief comparison, based on the 1965 Highway Capacity Manual, is offered.

Level "C"	Level "D"
- Stable flow (acceptable delay)	- Approaching unstable flow (tolerable delay)
- Serves 80 percent of capacity	- Serves 90 percent of capacity
- 30 percent of time a few drivers will wait through a green signal and go on second green signal	- 70 percent of time a few drivers will wait through a green signal and go on second green signal
- No drivers wait through two greens and go on third	- Occasionally drivers wait through two greens or more
- Average overall travel speed (including stopped time) = 20 mph	- Average overall travel speed (including stopped time) = 15 mph

Existing Plus Approved Development

Approved development traffic will nearly double existing traffic volumes in the study area. The significant reduction of the FP&L labor force on the island will alleviate potential severe congestion. However, analyses of existing plus approved development, considering the FP&L reduction, indicate that some minor congestion will occur in the study area. The potential also exists for isolated severe congestion unless intersections are improved. The conditions and possible improvements to reduce congestion are summarized in the following listing.

- North Island

Level of Service "C" or better will be provided on the transportation network associated with the north island, with the exception of the intersection of Royal Palm and SR A-1-A, where the level of service will be just into the "D" range. Level of Service "A" could be provided by adding a right turn lane on the north approach.

- South Island (Fort Pierce area)

The Fort Pierce bridge and adjacent roadway network will provide Level of Service "A". Certain improvements will be required at the intersections of Ocean Drive and Seaway Drive, and Ocean Drive and Binney Drive. These

intersections will experience severe congestion unless traffic signalization is provided. Because of the proximity of these intersections, it will be necessary for this signalization to be interconnected. Furthermore, geometric improvements required include, as a minimum, a left turn lane on the south approach of Ocean Drive at Binney Drive. With these improvements, Level of Service "A" can be provided.

In order to maintain desirable flow characteristics on SR A-1-A south of Binney Drive, it would be desirable to provide a three-lane cross-section similar to that developed in the south part of St. Lucie County. This cross-section would be developed between Binney Drive and Coconut Drive. In addition, any new access points developed along SR A-1-A will require appropriate turn lanes.

- South Island (Jensen Beach Causeway area)

The theoretical link capacity for SR A-1-A north of Jensen Causeway will be exceeded. In order to avoid serious congestion, it will be necessary to provide a four-lane cross-section from Jensen Causeway to approximately one mile north of the Martin County line.

The Jensen Causeway bridges will operate at Level of Service "D"; however, significant congestion will not occur if appropriate improvements are implemented at the causeway termination points. At Jensen Causeway and SR A-1-A, traffic signalization will be required. At the intersection of Jensen Causeway and Indian River Drive, signalization will be required as well as provision of a separate right turn lane on the south approach. With these improvements, Level of Service "A" would be provided at the Indian River Drive intersection and Level of Service "C" at the SR A-1-A intersection. Again, the link between these intersections will experience minor congestion and reduced travel speeds typical of Level of Service "D" operation.

Figure IV-4 identifies the improvements which will be required to provide Level of Service "C" or better operation during the peak season at full build-out of existing plus approved development. Table IV-4 reflects typical capacities for roadway sections considered in the future development analyses.

TABLE IV-4
TYPICAL GENERALIZED ROADWAY CAPACITIES

ROADWAY TYPE	CAPACITY	
	LEVEL OF SERVICE "C"	LEVEL OF SERVICE "D"
TWO-LANE	15,600	17,600
THREE-LANE	18,800	21,200
FOUR-LANE*	31,000	35,000**

*Four traffic lanes with center left-turn lane.

**Varies significantly depending on intersection configuration and turns; can reach 40,000 where no major intersections occur and higher on bridges with dual turn lanes, etc., at terminal intersections.

GMPP Analysis

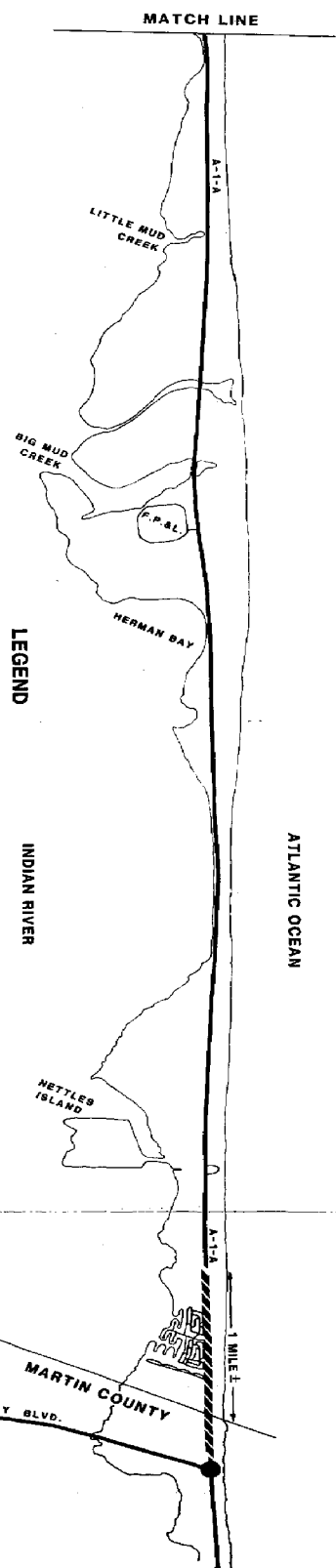
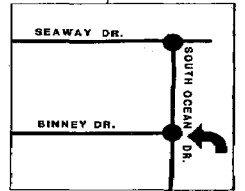
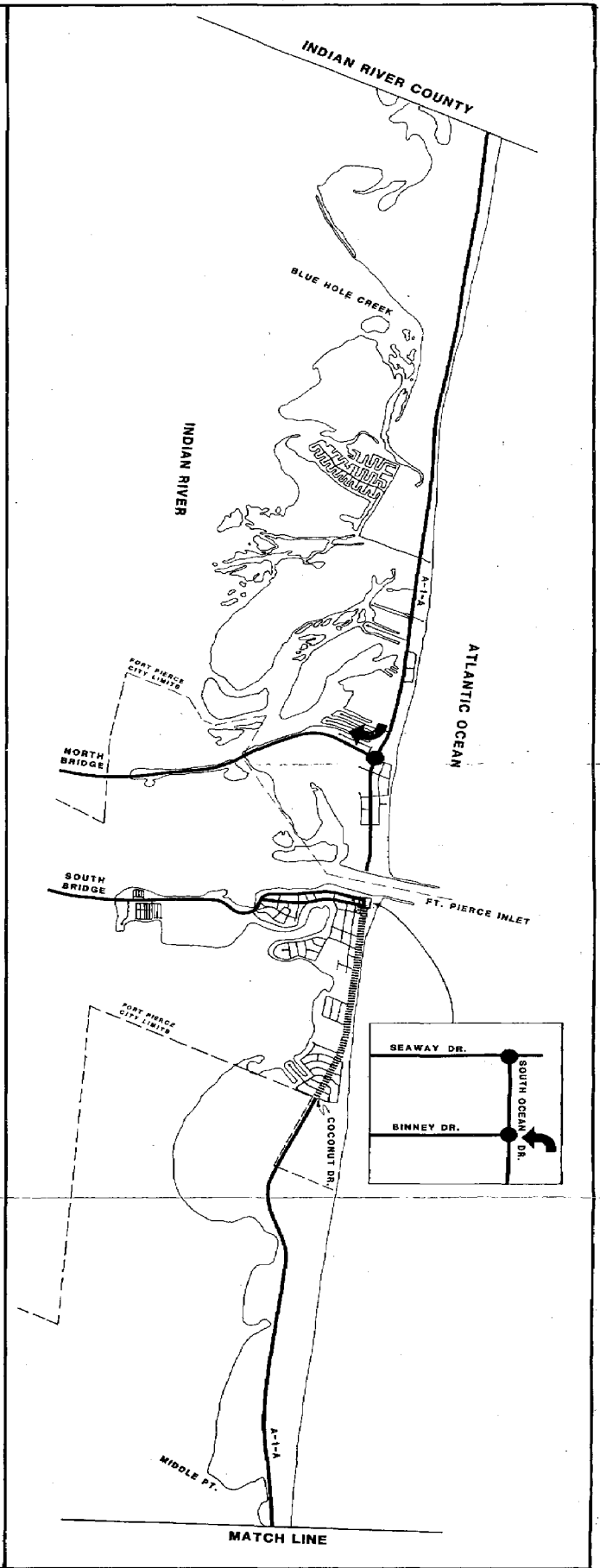
Because of the level of improvements needed to serve the traffic generated by GMPP development (including beach traffic, growth in Indian River and Martin Counties, and on-island trips), Level of Service "D" was used as a criterion in order to keep costs at the lowest level while still providing acceptable service. However, in most cases, the level of service provided is close to the "C" threshold. Minor reductions in the number of units developed under GMPP would provide a Level of Service "C". The following improvements were identified as necessary to provide Level of Service "D".

- North Island

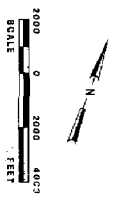
The North Bridge and SR A-1-A from Old Dixie Highway to Royal Palm Way should be widened to four lanes. An intersection improvement is required at Royal Palm Way and a grade separation is required at Old Dixie Highway and the Florida East Coast Railroad, with a right turn ramp from Old Dixie to the bridge entrance. State Route A-1-A will require widening to five lanes from Royal Palm Way to the Indian River County line.

- Fort Pierce

Seaway Drive should be widened to four lanes from the end of the four-lane section east of the bridge to the intersection with Binney Drive. Binney and Seaway Drives should be widened to three lanes east of their common intersections. Ocean Drive should be widened to five lanes from its intersection with Seaway Drive to the Fort Pierce city limit. Intersection improvements



- LEGEND**
- SIGNAL REQUIRED
 - ADDITIONAL RIGHT TURN LANE
 - ADDITIONAL LEFT TURN LANE
 - WIDEN TO 4 LANE WITH LEFT TURN LANE
 - PROVIDE CONTINUOUS CENTER LEFT TURN LANE



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**IMPROVEMENTS REQUIRED FOR
 EXISTING PLUS APPROVED DEVELOPMENT**

will be required at the Seaway Drive intersections with North Indian River Drive, Binney Drive, and Ocean Drive, and at the intersection of Binney Drive and Ocean Drive.

- South Island, North of FP&L

A new four-lane bridge should be built, connecting the mainland with SR A-1-A. In conjunction with the bridge, the access road will require four lanes from US 1 to the bridge, and grade separations are desirable over North Indian River Drive and the FEC Railroad. SR A-1-A will require widening to five lanes south of the new bridge connector to FP&L, and three lanes north of the bridge to Fort Pierce. Intersection improvements will be needed at SR A-1-A and the bridge connector.

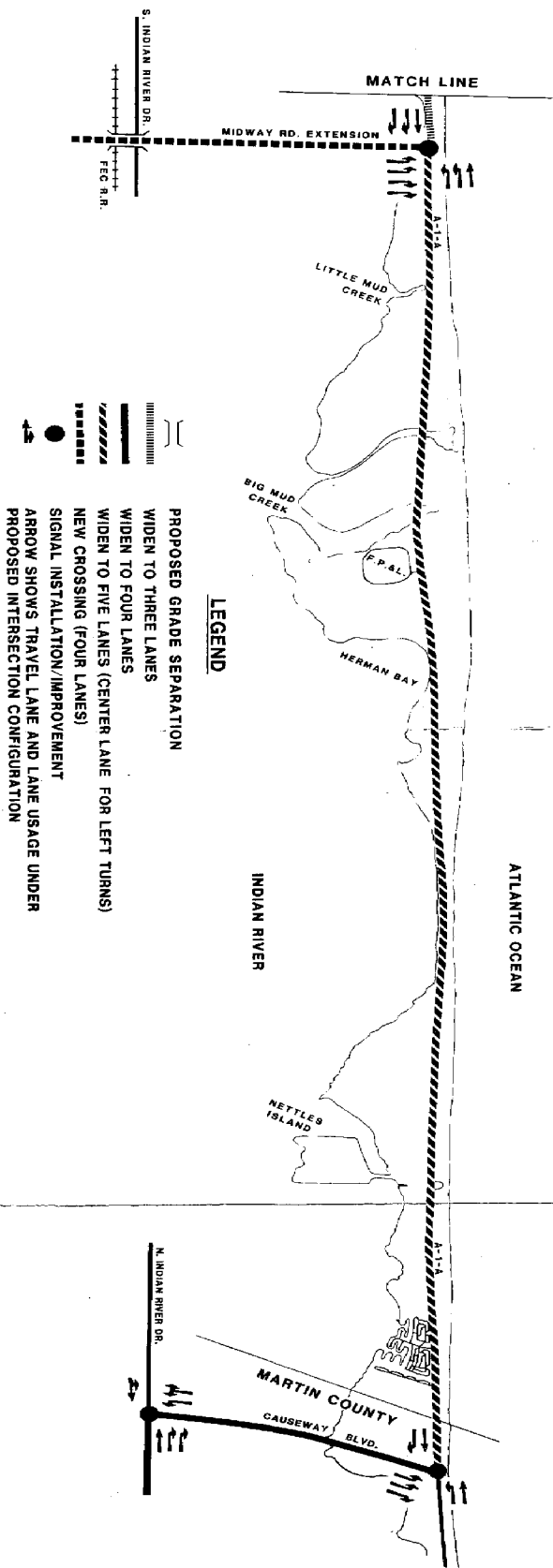
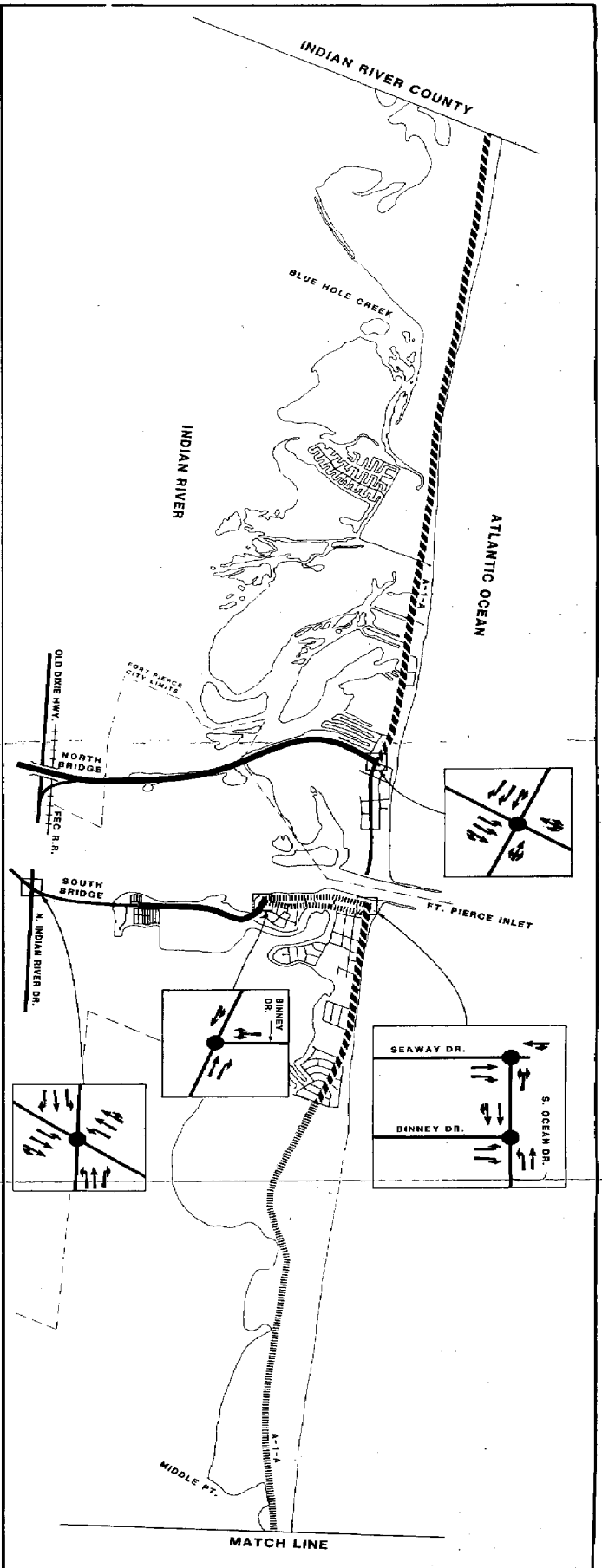
- South Island, South of FP&L

The Jensen Beach Causeway should be widened to four lanes, and improvements made at its intersections with North Indian River Drive and SR A-1-A. SR A-1-A will require widening to five lanes between the Jensen Beach Causeway and FP&L. Provision must also be made for upgrading the connection between the Jensen Causeway and US 1.

Figure IV-5 identifies the improvements that will be required to provide Level of Service "D" or better during the peak season at full build-out of GMPP development. Widening shown as four lanes would generally be four-lane divided sections with turn lanes provided at intersections and major access points. Intersection improvements are summarized in Table IV-4.

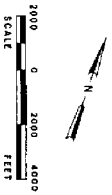
Three major options are available for providing a connection between the Jensen Beach Causeway and US 1. They include:

- Four lane the existing bridge and causeway; four lane North Indian River Drive to Commercial Street and four lane Commercial Street to US 1. A major constraint on this option is the narrow right-of-way along North Indian River Drive and the mobile home development along the right-of-way.
- Four lane the existing bridge and causeway, cross North Indian River Drive and construct a new alignment west to Savannah Road. Four lane Savannah Road south to Commercial Street from Savannah Road to US 1. Major constraints on this option are the mobile home development immediately across North Indian River Drive from the bridge and the single-family home development farther west.
- Realign the western causeway portion to tie directly into Commercial Street. Widen Commercial Street to US 1. The major constraint on this option is the need for a fill permit for realigning the causeway.



LEGEND

- PROPOSED GRADE SEPARATION
- WIDEN TO THREE LANES
- WIDEN TO FOUR LANES
- WIDEN TO FIVE LANES (CENTER LANE FOR LEFT TURNS)
- NEW CROSSING (FOUR LANES)
- SIGNAL INSTALLATION/IMPROVEMENT
- ARROW SHOWS TRAVEL LANE AND LANE USAGE UNDER PROPOSED INTERSECTION CONFIGURATION



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IMPROVEMENTS REQUIRED
 FOR GMP DEVELOPMENT

FIGURE
 IV-5

The selection of a single option for this improvement is beyond the scope of this study; a detailed corridor study is needed to determine the environmental and socio-economic impact of the three options. The costs in Table IV-4 and the traffic volumes shown in Figures IV-2 and IV-3 are based on the first option described above.

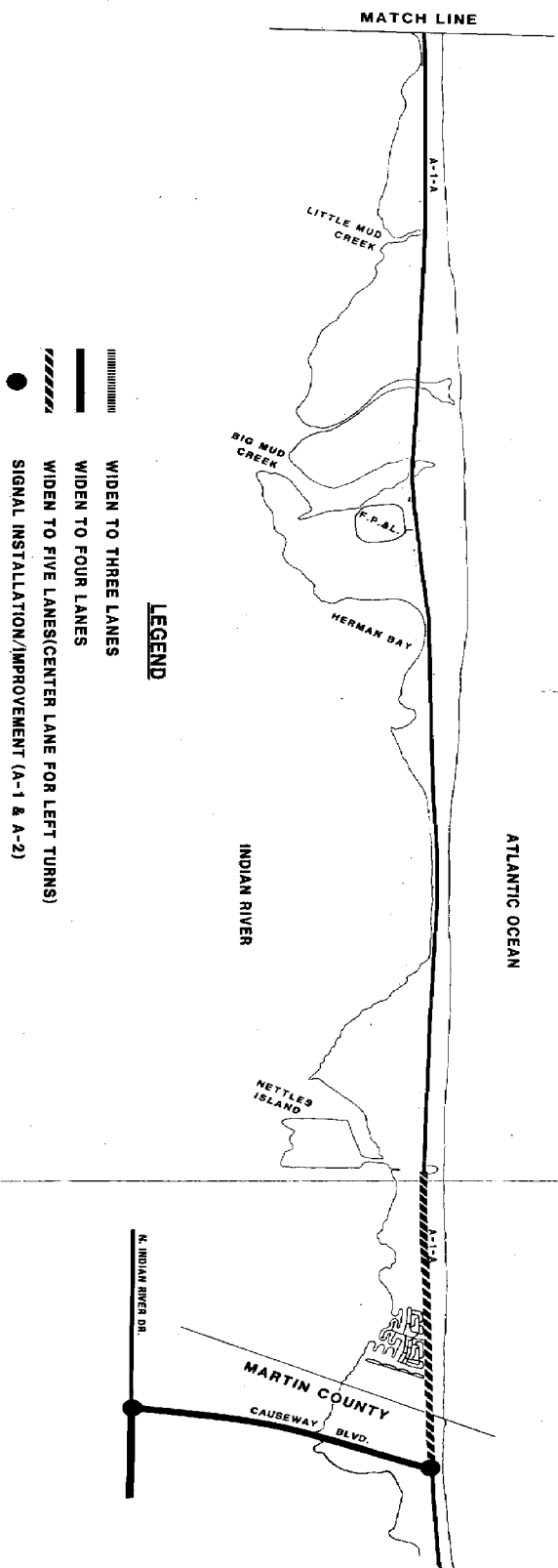
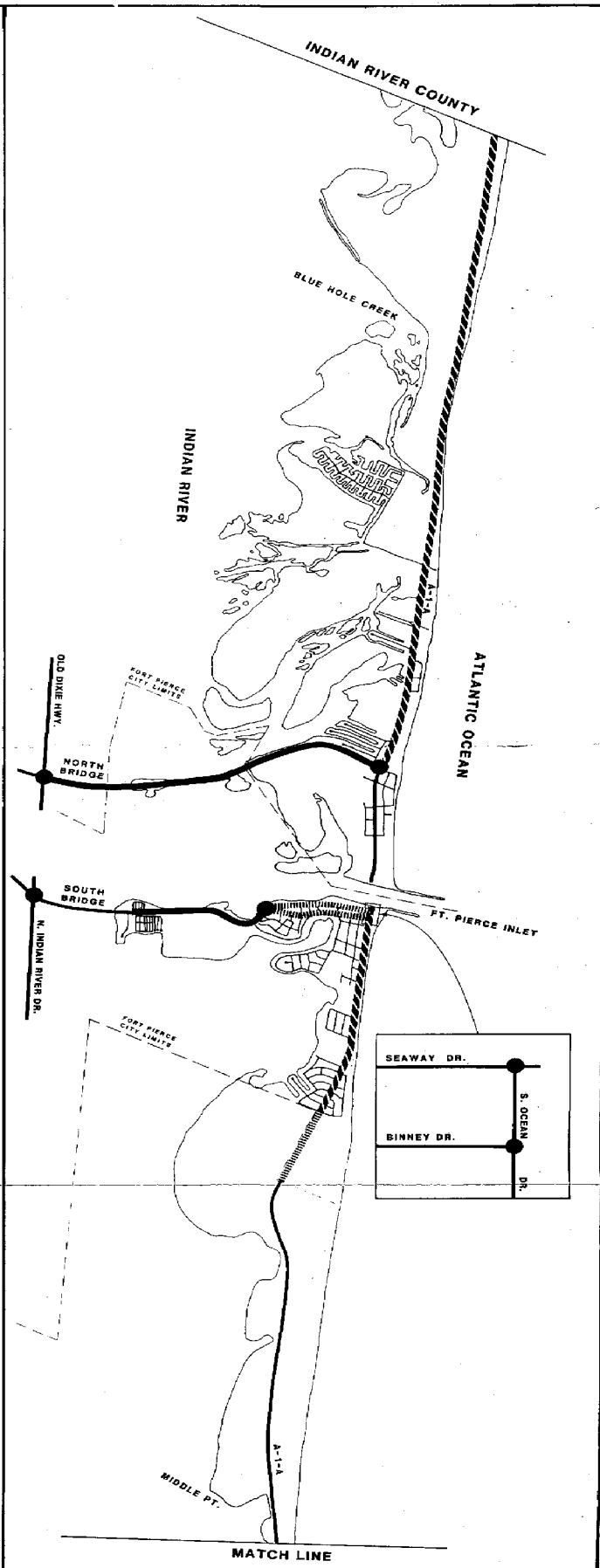
Alternatives Analysis

Traffic generated by the development in Alternative 1 will require a considerably less costly improvements. On the north island, a development level was identified which does not require the bridge over the railroad and Old Dixie Highway. Fort Pierce roads will require approximately the same level of improvement as in the GMPP. A new bridge to the south island will not be needed, and the level of widening required on SR A-1-A will be much less. Five-laning of SR A-1-A will extend from the Jensen Beach Causeway to just past the entrance to Nettles Island. Turn lanes should be provided at major entrances along the two-lane portions of A-1-A. Widening of the North Bridge and the Jensen Beach Causeway would still be required, as would various intersection improvements.

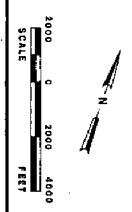
The development under Alternative 2 would require only relatively minor transportation improvements. Widening existing bridges would not be required, and no bridge would be built. On the north island, only intersection improvements would be needed. Ocean Drive and Seaway Drive would still be widened in Fort Pierce, and intersection improvements would still be required. The only improvements needed for the south island would be intersection improvements for Jensen Beach Causeway at North Indian River Drive and SR A-1-A, and the five-laning of SR A-1-A from the Jensen Beach Causeway to approximately one mile north of the Martin County line. Turn lanes should be provided at major entrances along the two-lane portions of A-1-A.

Under Alternative 2, even with no development beyond that already approved south of the FP&L plant and development north of the plant constrained to provide Level of Service "D" on Seaway and Binney Drives, the Jensen Beach Causeway would operate below Level of Service "D". Traffic flow on both sides of the bridge would be acceptable, but traffic on the bridge itself would be congested, with congested conditions prevailing during the peak hour.

Figures IV-6 and IV-7 identify the general roadway improvements that will be required to provide Level of Service "D" or better for development based on Alternatives 1 and, respectively. Table IV-5 describes specific intersection improvements that would be required by the GMPP AND Alternatives 1 and 2.



- LEGEND**
- WIDEN TO THREE LANES
 - WIDEN TO FOUR LANES
 - WIDEN TO FIVE LANES(CENTER LANE FOR LEFT TURNS)
 - SIGNAL INSTALLATION/IMPROVEMENT (A-1 & A-2)

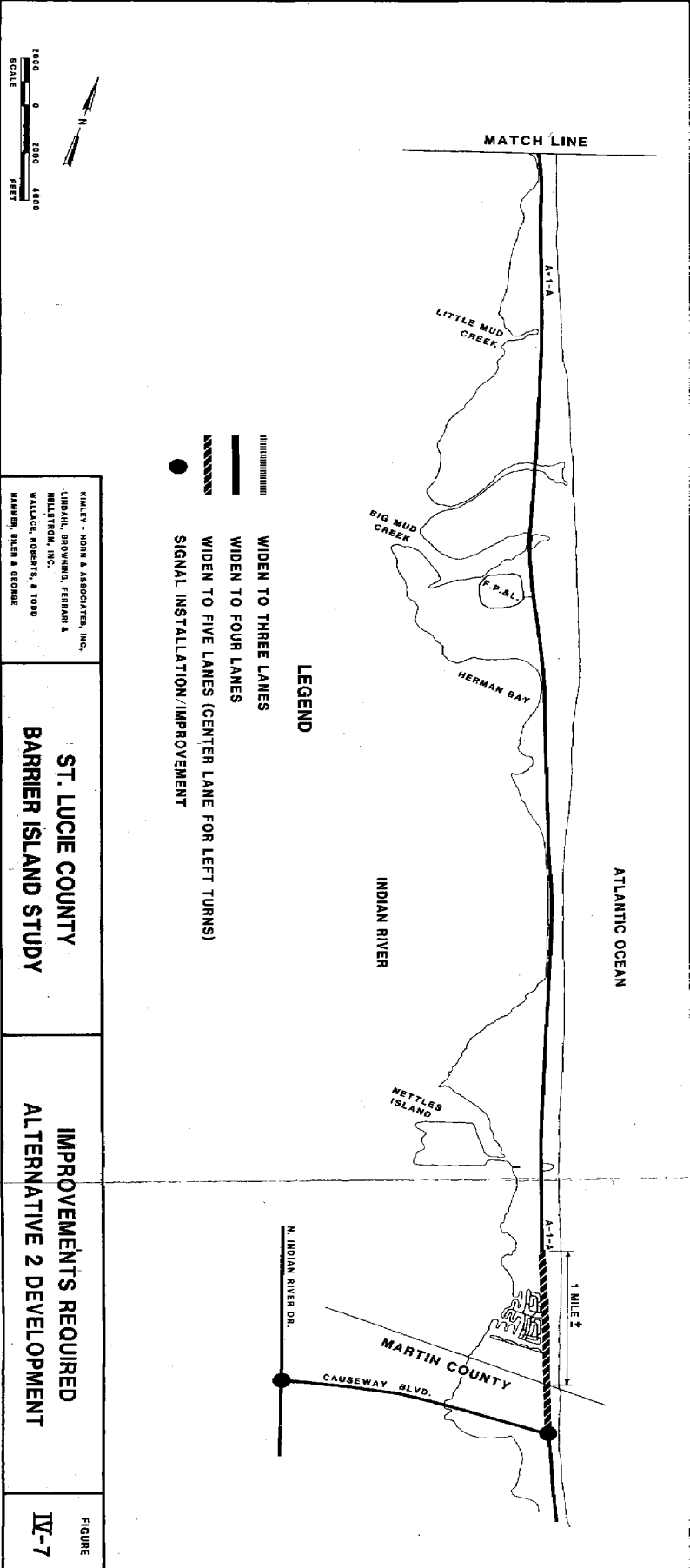
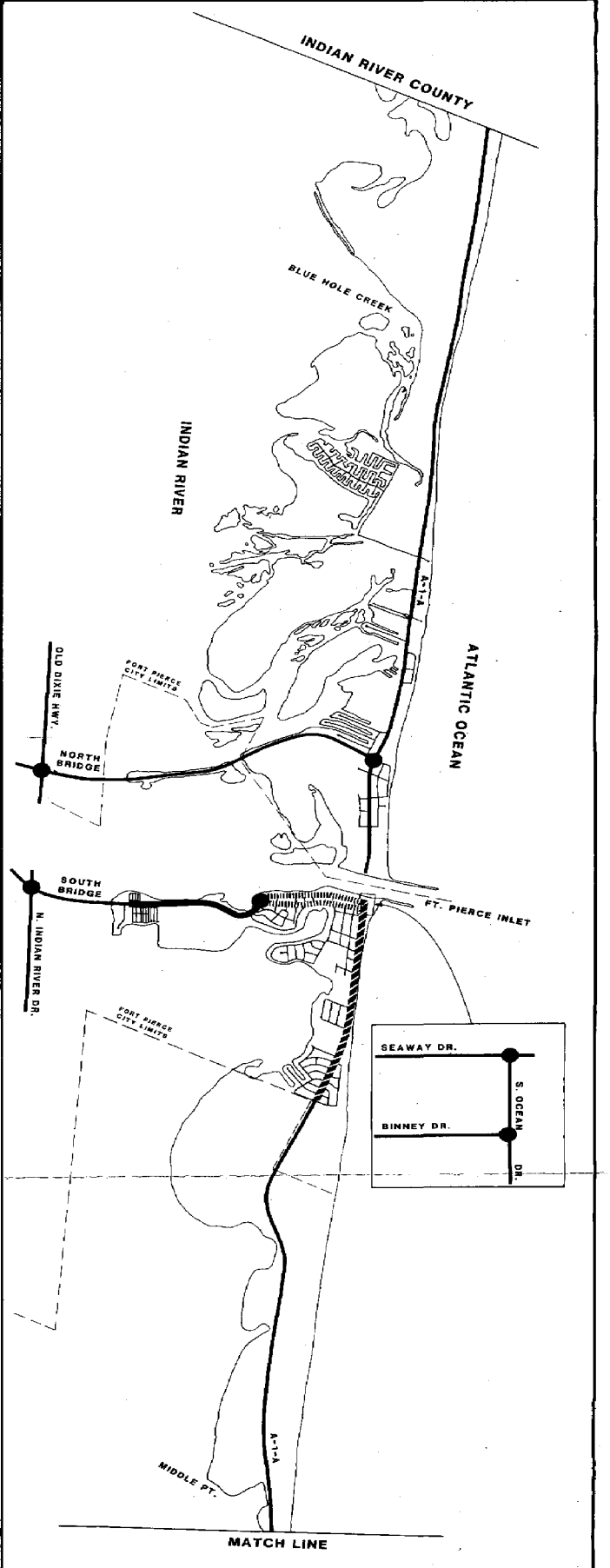


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IMPROVEMENTS REQUIRED
ALTERNATIVE 1 DEVELOPMENT

FIGURE
IV-6



ST. LUCIE COUNTY
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IMPROVEMENTS REQUIRED
ALTERNATIVE 2 DEVELOPMENT

FIGURE
IV-7

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TABLE IV-5
REQUIRED INTERSECTION IMPROVEMENTS
(for Level of Service "D")

<u>Intersection</u>	<u>Plan</u>	<u>Improvement Required</u>
<u>NORTH ISLAND:</u>		
A-1-A at Royal Palm Way	GMPP, A1	Add second left turn lane on west approach; add two right turn lanes on north approach. Revise signalization.
	A2	Add right turn lane on north approach. Revise signalization.
A-1-A at Old Dixie Highway	GMPP	Construct grade separation at Old Dixie Highway and FEC RR, with right turn lane from south approach.
	A1	Add through lane and left turn lane on east approach; add right turn ramp on south approach. Revise signalization.
	A2	Add right turn lane on south approach. Revise signalization.
<u>FORT PIERCE:</u>		
Seaway Drive at North Indian River Drive	GMPP	No geometric improvements required.
	A1	Add second right turn lane on south approach. Revise signalization.
	A2	Add right turn lane on south approach. Revise signalization.
Seaway Drive at Binney Drive	GMPP, A1, A2	Revise signalization.
Seaway Drive at Ocean Drive	GMPP, A1, A2	Add right turn lane on west approach. Signalize.

TABLE IV-5 (CONTINUED)

<u>Intersection</u>	<u>Plan</u>	<u>Improvement Required</u>
Ocean Drive at Binney Drive	GMPP, A1, A2	Add right turn lane on west approach; add left turn lane on south approach; add through/right lane on north approach. Signalize.
<u>SOUTH ISLAND:</u>		
Jensen Beach Causeway at SR A-1-A	GMPP, A1, A2	Add second left turn lane on west approach. Signalize. Signalize.
Jensen Beach Causeway at North Indian River Drive	GMPP, A1 A2	Add dual right turn lanes on south approach; add second left turn lane on east approach. Signalize. Add right turn lane on south approach. Signalize.
New Bridge at SR A-1-A	GMPP A1, A2	Add dual left and right turn lanes on west approach. Add dual left turn lanes to south approach; add dual right turn lanes to north approach. No improvements required.

Cost estimates for the three alternative development plans reveal substantial cost differences among the plans. Construction costs for the improvements required for GMPP development are in excess of \$59 million, while costs for Alternative 1 are only a fraction of that amount, \$21 million. Costs for Alternative 2 are yet another order of magnitude lower, less than \$3 million. The major difference between GMPP and Alternative 1 is due to the \$31-million new bridge, an additional \$6-million for widening SR A-1-A on the south island, and the \$2-million grade separation over Old Dixie Highway and the railroad. The difference between Alternative 1 and Alternative 2 is due principally to widening the Jensen Beach Causeway (extending to US 1) at \$8-million, widening the North Bridge at \$6-million, and widening SR A-1-A on the north island at \$4-million. The improvement costs are summarized on Table IV-6.

The improvements identified in this chapter will accommodate a worst-case condition. The analysis undertaken has identified the maximum traffic volumes that could be expected if 100 percent of the development on the island were occupied simultaneously. Based upon our inventory of winter occupancy, it is likely that as much as 10 to 15 percent of the total units may be vacant at any one time. This, of course, would significantly reduce the demands on the system. Furthermore, it should be considered in evaluating improvements that the conditions identified in this chapter will be experienced during approximately three or four months per year. Off peak season traffic is approximately 60 percent of peak season flow. Thus, for a Level of Service "D" or "E" identified during the winter season, Level of Service "A" will be provided during the remainder of the year.

TABLE IV-6
SUMMARY OF TRANSPORTATION IMPROVEMENT COSTS

<u>Improvement by Area</u>	<u>Costs in \$ Millions</u>		
	<u>GMPP</u>	<u>A1</u>	<u>A2</u>
<u>North Island</u>			
A-1-A Widening	3.59	3.59	--
A-1-A at Royal Palm	0.12	0.12	0.06
A-1-A at Old Dixie	2.00	0.18	0.06
Bridge Widening	<u>5.88</u>	<u>5.88</u>	<u>--</u>
Subtotal	11.59	9.77	0.12
<u>Ft. Pierce</u>			
Ocean Drive Widening	0.45	0.45	0.38
Seaway Drive and Widening	0.88	0.88	0.88
Binney Drive Widening			
Seaway at N. Indian River	0.04	0.06	0.06
Seaway at Binney	0.04	0.04	0.04
Seaway at Ocean	0.06	0.06	0.06
Ocean at Binney	<u>0.14</u>	<u>0.14</u>	<u>0.14</u>
Subtotal	1.61	1.63	1.56
<u>South Island</u>			
A-1-A Widening	7.17	1.10	0.69
Jensen at A-1-A	0.06	0.10	0.06
Jensen at N. Indian River	0.10	0.10	0.06
New Bridge at A-1-A	0.18	--	--
New Bridge	30.93*	--	--
Jensen Widening	<u>7.91</u>	<u>7.91</u>	<u>--</u>
Subtotal	46.35	9.21	0.81
TOTAL	58.34	20.61	2.49

* Includes \$2.0 million for desirable railroad overpass.

CHAPTER V
WATER AND WASTEWATER NEEDS AND COSTS

The intent of the study and analysis described in this chapter is to identify the future water and wastewater needs of the study area, presuming that development will occur to the maximum extent, as estimated for the three separate conditions outlined in Chapter III. These needs are translated into estimates of cost for the water and wastewater improvements for both the north island and the south island.

DESIGN CRITERIA - WATER SYSTEMS

Design criteria used in determining needed improvements for expansion or extension of the existing water systems are shown below.

- Design Demand = Peak Daily Flow (PDF) + 1,500 gpm fire flow
- PDF = Average Daily Flow (ADF) x 1.5
- Single Family ADF = 245 gallons/day/unit
- Multi-family ADF = 175 gallons/day/unit
- Recreational vehicle and Transitory Hotel/Motel
= 170 gallons/day/unit
- Minimum acceptable residual in main = 20 psi
- C = 130

The ADF demands used in this study have been taken from a report entitled, "Engineering Report, Water System Master Plan for the Fort Pierce Utilities Authority, Fort Pierce, Florida," dated November, 1980, and prepared by the Fort Pierce Utility Authority's (FPUA) consulting engineers, CH2M-Hill. The report indicates that the FPUA's records were researched and that residential use was found, by experience, to be 70 gallons per capita per day (gpcd), and that the peak daily flow (PDF) was found to be 1.5 times greater than the average daily flow (ADF). Conversion from per capita use to single-family and multi-family residential use was made by multiplying 70 gpcd by a factor of 3.5 persons/unit and 2.5 persons/unit, respectively.

Commercial demands for uncommitted lands in the study area were estimated by use of the following formula:

$$\text{Demand, gpm} = \frac{\text{Usable Acreage} \times (43,560 \text{ sf/acre}) \times (0.03 \text{ gpd/sf})}{1,440 \text{ minutes/day}}$$

The analysis run on the south island to determine additional distribution system improvements included demands for all dwelling units and commercial uses for the entire study area. All projects which are now, or proposed to be, served by the Martin County water system or by on-site plants have been connected to the FPUA system for analysis along with the additional new units. A contractual demand of 1,200 gpm to serve the Florida Power & Light Company (FP&L) nuclear power plant has not been included in the design demand of PDF plus fire flow, since the FP&L demand can be controlled by the FPUA with a remote system. Officials of FP&L and the FPUA that, in the event of a fire demand on the line, the valve controlling the FP&L withdrawal would be closed for the duration of the emergency. The new distribution line, which would run parallel to the existing distribution line owned, operated and maintained by the FPUA, would be interconnected with the existing line to create a hydraulically looped system, thereby balancing pressures for a more efficient system.

The analysis run on the north island to determine additional distribution system improvements included demands for all dwelling units and commercial uses for the entire study area. All projects which are now, or proposed to be, served by on-site plants have been connected to the North Hutchinson Services, Inc., (NHS) system for analysis along with the additional new units.

DESIGN CRITERIA - WASTEWATER SYSTEMS

Since none of the study area (except for that portion lying in the limits of the City of Ft. Pierce) is served by an existing municipal or regional plant for its wastewater needs, new sewage transmission, treatment and disposal improvements must be constructed. Treatment plant size was determined by estimating total average daily flow for the various units. This average daily flow (ADF) was taken from the same source as the ADF for the water system analysis, the report referenced previously that was prepared in 1980 by CH2M-Hill for the FPUA. Similarly, the ADF conversions from per capita values to dwelling unit values was as explained in the previous section entitled, "Design Criteria - Water Systems."

Other basic design criteria relate to more specific requirements of the Florida Department of Environmental Regulation (DER), the state agency having jurisdiction over the design, construction and maintenance of wastewater systems. These criteria are not enumerated here, but have been considered in evaluating the wastewater improvements needed for the barrier islands.

Since the FPUA can, and does, serve all of the study area within the City of Ft. Pierce (except for a portion of Ocean Village), this study considers that all areas in the corporate limits of Ft. Pierce will continue to be served by the existing FPUA wastewater plant, located on the Causeway Island at the east end of the South Bridge.

All projects in the unincorporated areas of St. Lucie County would be served by new transmission, treatment and disposal systems: one on the north island and one on the south island. All units on both islands, including existing, approved and estimated future, are considered to connect ultimately with the proposed wastewater facilities.

NEEDS AND COSTS - WATER SYSTEMS

Water systems needs and improvements for both islands have been considered under the three conditions described in Chapter III:

1. Development under the Growth Management Policy Plan (GMPP) provisions;
2. Alternative 1, which is growth constrained by no new bridge to the south island, and no railroad overpass west of the North Bridge; and
3. Alternative 2, which is growth constrained by no new bridge to the south island, no railroad overpass west of the North Bridge, and no improvements to existing bridges on either island.

On the north island under both GMPP and Alternative 1 conditions, the additional water system improvements consist of:

- Extension of the present 18-inch main northerly to the north St. Lucie County line.
- Installation of valves, hydrants and fittings in the extended main.
- Construction of a 1.0-million-gallon ground storage and repumping station.
- Altitude valves and disinfection equipment.

The only difference between the system needs for GMPP and Alternative 1 is the reduction in size of a portion of the main for Alternative 1.

It was found that system improvements for Alternative 2 cannot be justified for the few number of new units to be added (800). Too few units have an unknown geographic distribution, thereby making future capital improvements to the system economically unrealistic and unlikely.

Estimates of construction costs for the two conditions described for north island water system improvements, including 15 percent for engineering and contingencies, are shown in Table V-1, and proposed water system improvements are illustrated on Figures V-1 and V-2.

TABLE V-1
NORTH ISLAND WATER SYSTEM

(Estimates of Construction Costs)

<u>Condition</u>	<u>Estimated Cost</u>
GMPP	\$1,600,000
Alternative 1	\$1,500,000

On the south island (not including the City of Ft. Pierce) under both GMPP and Alternative 1 conditions, the additional water system improvements consist of:

- Construction of a new distribution line southerly from the Jaycee Park elevated storage tank and repump station, paralleling the existing line, to the south St. Lucie County line.
- Installation of valves and fittings in the extended main.
- Additional pumps in the two repump stations.
- Altitude valves and disinfection equipment.

As is the case with the water system on the north island, the only difference between the system needs for GMPP and Alternative 1 is a reduction in the size of a portion of the main for Alternative 1.

Similarly, it was found that system improvements for Alternative 2 cannot be justified for the few number of new units to be added (843). Too few units have an unknown geographic distribution, thereby making future capital improvements to the system economically unrealistic and unlikely.

Estimates of construction costs for the two conditions described for the south island water system improvements, including 15 percent for engineering and contingencies, are shown in Table V-2, and proposed water system improvements are illustrated on Figures V-1 and V-2.

TABLE V-2
SOUTH ISLAND WATER SYSTEM

Estimates of Construction Costs

<u>Condition</u>	<u>Estimated Cost</u>
GMPP	\$2,950,000
Alternative 1	\$2,100,000

NEEDS AND COSTS - WASTEWATER SYSTEMS

Wastewater system needs and improvements for both islands have been considered under the three conditions described in Chapter III:

1. Development under the Growth Management Policy Plan (GMPP) provisions;
2. Alternative 1, which is growth constrained by no new bridge to the south island, and no railroad overpass west of the North Bridge; and
3. Alternative 2, which is growth constrained by no new bridge to the south island, no railroad overpass west of the North Bridge, and no improvements to existing bridges on either island.

The basic system for both islands is the same for both GMPP and Alternative 1 conditions, requiring the construction of the following elements:

- A wastewater treatment plant, consisting of secondary treatment and filtration;
- A deep well injection system for the disposal of treated effluent into the boulder zone; and

- A transmission system (force main) for the length of the service area into which individual projects would pump wastewater.

The estimated costs of construction for the systems under both GMPP and Alternative 1 conditions, including 15 percent for engineering and contingencies, are shown for the north island in Table V-3, and for the south island in Table V-4. Proposed wastewater system improvements for the north island and the south island are illustrated on Figure V-3.

TABLE V-3
NORTH ISLAND WASTEWATER SYSTEM
Estimates of Construction Costs

<u>Condition</u>	<u>Required Capacity, MGD</u>	<u>Estimated Cost</u>
GMPP	2.4	\$4,800,000
Alternative 1	1.8	\$4,150,000

TABLE V-4
SOUTH ISLAND WASTEWATER SYSTEM
Estimates of Construction Costs

<u>Condition</u>	<u>Required Capacity, MGD</u>	<u>Estimated Cost</u>
GMPP	3.9	\$6,900,000
Alternative 1	2.0	\$4,900,000

Evaluation of Alternative 2 for both the north island and the south island revealed that the construction of new wastewater transmission, treatment and disposal systems could not be justified because of the low number of new units that could be built and the unknown geographic distribution of those units. As indicated previously, only 800 new units could be built on the north island, and only 843 on the south island under the constraints of Alternative 2.

SPECIAL NOTES

- Land cost determination for construction of the wastewater treatment plants and disposal systems for the barrier islands is beyond the scope of this report and has not been addressed.
- Locations of wastewater treatment plants for the barrier islands, as shown on the appropriate figures, is schematic only. Ultimate location would be subject to final design requirements and land availability.
- If a regional wastewater treatment plant is constructed on the south island, consideration should be given to possible disposal of the treated effluent through the ocean outfall system of the FP&L Company nuclear power plant, in cooperation with FP&L. This disposal method would eliminate the need of constructing an expensive effluent disposal well.
- It is emphasized that local, regional, state and Federal laws and regulations do not prohibit the construction of on-site water and wastewater facilities to serve projects on the barrier islands that have no access to existing facilities. Rather, regulations exist which permit the construction and use of on-site utility systems, provided that the various elements of the utility systems meet certain minimum criteria. Therefore, the unavailability of existing water or wastewater utilities are not an absolute deterrent to the construction of a new project. However, the expense of on-site utilities must be considered by each developer at the time the project is conceived. Thus, the only constraint as to whether a project can be built without existing water or wastewater service is a financial one.

CHAPTER VI
PUBLIC SAFETY NEEDS AND COSTS

FIRE AND EMERGENCY MEDICAL SERVICES

Fire and ambulance services are currently provided from the fire station on Seaway Drive in Fort Pierce. The site is staffed with 15 men, 5 per shift. The station equipment includes a pumper, a tanker and an ambulance. Response times to the south end of St. Lucie County are 16 to 18 minutes. This excessive response time has prompted the construction of a new station across from the Sand Dollar development in the southern part of St. Lucie County.

The new station will be equipped with a snorkel, a pumper and an ambulance. The station will open with 12 men, 4 per shift. With the new station, maximum response time will be 5 to 6 minutes.

It is estimated that the current fire fighter/population ratio on the south island is about 1:600. This ratio is slightly better than the general criteria of 1:900 used by the Fire District on a countywide basis.

The current population on the north island does not justify a station and thus, service is provided from the mainland. Response times are variable as they are subject to interference from the north bridge openings. A new station is planned for the north island. It will be basically the same as the new south island station and will be constructed when required by island growth.

Planned fire service will be adequate for existing plus approved development on the south island; however, the high percentage of elderly suggest the need for a paramedic team. Therefore, the new south station should be equipped with an advanced life support system. North island population growth will require the addition of six firemen at an existing mainland station.

Population growth under the GMPP will require a total of 90 firefighting personnel and four stations, one on the north island, one in Fort Pierce, and two on the south island. Sixty fire-fighters and three stations will be required under Alternative 1, while Alternative 2 would require 45 firefighters and two stations. (These figures include existing stations and personnel.) Costs for the three alternatives would range from \$1.28 million to \$2.56 million in annual operating costs and from \$0.91 million to \$2.73 million in capital cost. The cost of the proposed south island fire station is included in these capital costs. Table VI-1 lists personnel and station requirements and capital and operating costs for each major sub-area within the study area.

TABLE VI-1
SUMMARY OF FIRE PROTECTION NEEDS AND COSTS
(Costs in \$ Millions)

	<u>GMPP</u>	<u>A1</u>	<u>A2</u>	<u>Existing</u>
<u>SUB-AREA I - SOUTH ISLAND, SOUTH OF FP&L</u>				
Personnel Required	27	18	15	(12 planned)
Stations Required	1	1	1	(1 planned)
Annual Operating Cost	0.73	0.55	0.49	
Capital Cost	0.91	0.91	0.91	
<u>SUB-AREA II - SOUTH ISLAND, NORTH OF FP&L</u>				
Personnel Required	20	7	4	(served by Ft. Pierce)
Stations Required	1	--	--	
Annual Operating Cost	0.59	0.14	0.08	
Capital Cost	0.91	--	--	
<u>SUB-AREA III - FORT PIERCE ON SOUTH ISLAND</u>				
Personnel Required	17	15	17	15
Stations Required	1	1	1	1
Annual Operating Cost	0.53	0.49	0.53	
Capital Cost	--	--	--	
<u>SUB-AREA IV - NORTH ISLAND</u>				
Personnel Required	26	20	9	
Stations Required	1	1	--	
Annual Operating Cost	0.71	0.59	0.18	
Capital Cost	0.91	0.91	--	
<u>TOTAL STUDY AREA</u>				
Personnel Required	90	60	45	
Stations Required	4	3	2	
Annual Operating Cost	2.56	1.77	1.28	
Capital Cost	2.73	1.82	0.91	

NOTE: Operating cost includes salaries, fringe benefits and station and vehicle expenses. Capital cost includes buildings, vehicles, equipment.

POLICE AND SHERIFF SERVICES

The City of Fort Pierce has one unit assigned to Fort Pierce Beach, operating out of police headquarters on the mainland. The Chief of Police indicates this provides sufficient coverage except when officers are required by other zones for back-up. Recently, demands on the mainland have reduced the department's ability to provide full-time coverage of this zone. Citywide, the police department has 2.1 officers per 1,000 population. However, on the island, one full-time unit translates into about one officer per 1,800 population.

The St. Lucie County Sheriff's Department also has one full-time unit on the island. However, there is no backup available when officers are required to appear in court or when prisoners are transported to the mainland. The Sheriff's Department uses a criterion of one deputy per 1,000 population. Currently, the one full-time unit corresponds to about one deputy per 1,000 unincorporated population.

City police and sheriff manpower will need to be increased by one and nine men, respectively, to serve existing plus approved development on the barrier islands. An additional patrol car will be required in Fort Pierce and nine cars in the county (three on the north island, six on the south). These demands will be much lower in the off season. A substation will also be needed on the south island. This can be incorporated into the new fire station building planned for the south island.

Population growth under the GMPP will require a total of 80 law enforcement personnel on the islands. Plans Alternative 1 and Alternative 2 will require 40 and 53 personnel, respectively. Operating costs for the three plans would range from \$0.96 million to \$1.91 million annually, while capital costs would range from \$0.58 million to \$1.17 million. Capital costs assume substations attached to each new fire station, and one vehicle per officer. Table VI-2 lists personnel and station requirements and operating and capital costs for each major sub-area within the study area.

EMERGENCY EVACUATION

Consideration has been given to island evacuation time in the event of a sudden disaster for the existing plus approved developments as well as for the three full development alternatives. Hurricane evacuation considerations are being addressed separately by the Treasure Coast Regional Planning Council. The most obvious other possible emergency condition would be a radiological emergency. Analyses have, therefore, been conducted considering such an emergency. In a planned evacuation, school buses would be used to assist in the evacuation and reduce the demands on the island bridges. However, it is unlikely that any significant pooling could be accomplished in an immediate evacuation condition. Therefore, it was assumed as a worst-case analysis that each dwelling unit would generate one vehicle. The following is a summary of our analyses and findings. (All evacuation times assume that bridges over the Intracoastal Waterway would remain in the closed position (open to traffic) throughout the emergency.)

TABLE VI-2
SUMMARY OF LAW ENFORCEMENT NEEDS AND COSTS
(Costs in \$ Millions)

	<u>GMPP</u>	<u>A1</u>	<u>A2</u>	<u>Existing</u>
<u>SUB-AREA I - SOUTH ISLAND, SOUTH OF FP&L</u>				
Personnel Required	24	16	13	3 (shared w/sub-area II)
Stations Required	1	1	1	(1 sub-station planned)
Annual Operating Cost	0.57	0.38	0.31	
Capital Cost	0.35	0.24	0.20	
<u>SUB-AREA II - SOUTH ISLAND, NORTH OF FP&L</u>				
Personnel Required	18	6	4	3 (shared w/sub-area I)
Stations Required	1	--	--	
Annual Operating Cost	0.43	0.14	0.10	
Capital Cost	0.27	0.08	0.06	
<u>SUB-AREA III - FORT PIERCE ON SOUTH ISLAND</u>				
Personnel Required	15	13	15	3
Stations Required	1	1	1	1
Annual Operating Cost	0.36	0.31	0.36	
Capital Cost	0.21	0.18	0.21	
<u>SUB-AREA IV - NORTH ISLAND</u>				
Personnel Required	23	18	8	
Stations Required	1	1	--	
Annual Operating Cost	0.55	0.43	0.19	
Capital Cost	0.34	0.27	0.11	
<u>TOTAL STUDY AREA</u>				
Personnel Required	80	53	40	
Stations Required	4	3	2	
Annual Operating Cost	1.91	1.26	0.96	
Capital Cost	1.17	0.77	0.58	

NOTE: Operating cost includes salaries, fringe benefits, fuel, maintenance. Capital cost includes buildings, vehicles, uniforms, weapons.

North Island

Two scenarios were considered here:

- (1) A radiological emergency with SR A-1-A north and the north bridge serving as evacuation routes.
- (2) Other emergency requiring all evacuation via the north bridge.

A total of approximately 3,500 vehicles would be evacuated for existing plus approved development. Since current disaster plans require the use of only one lane on two-lane facilities, a maximum capacity of 2,000 vehicles per hour can be accommodated. In Case 1, it would take approximately 55 minutes to evacuate the island. In Case 2, the time would be doubled or 100 minutes. In either case, if the north and south islands were being evacuated simultaneously, traffic crossing the north bridge would be routed northbound on Old Dixie. If the south island were not being evacuated, US 1 would also be used.

The population under GMPP would require 90 minutes to evacuate using the north bridge and SR A-1-A north, or 125 minutes using the north bridge only, assuming that three lanes of the four-lane bridge could be used for west-bound travel. The evacuation times for Alternative 1 development would be 80 minutes or 95 minutes, respectively. The evacuation times for Alternative 2 would be 65 minutes using both routes and 130 minutes using the bridge only. The bridge-only evacuation time is significantly increased, in spite of the smaller population, because of the one lane (2,000 vehicles/hour) evacuation capacity of the unimproved bridge.

South Island (North of FP&L)

Although the Fort Pierce bridge has significant capacity, SR A-1-A to the east is only two lanes. This restricts the evacuation capability. It would take 140 minutes to evacuate the area north of the power plant. It should be pointed out, however, that the residents of the 1,022 existing or approved units between the power plant and the City of Fort Pierce could be more than seven miles from the plant in five minutes driving time. In addition, with the improvement of SR A-1-A to three lanes, evacuation from Fort Pierce could be accomplished in 70 minutes.

Under the GMPP, it is assumed that residents of Fort Pierce and Zones S-6 and S-7 would use the South Bridge for a radiological emergency, while residents of S-5 would use the new bridge. The evacuation time for the northern zones would therefore be 220 minutes, with a 40-minute evacuation time for Zone S-5. If both bridges could be used to effectively evacuate the island, the time would drop to 120 minutes, with residents of Fort Pierce and Zone S-7 using the south bridge and other residents of the north half of the island using the new bridge. Under Alternative 1 development, an evacuation time of 150 minutes would be expected, with all traffic using the south bridge. Under Alternative 2, evacuation time would be 145 minutes.

CHAPTER VII

REVENUE ANALYSIS

As noted in other chapters of this report, future development of St. Lucie County's barrier islands will have significant impacts on transportation systems, public utility facilities, public safety requirements, and the natural environment. Each of these areas of impact will be reflected in tangible and intangible costs to visitors, residents, developers, and public agencies. At the same time, new development will generate additional revenues and benefits which will offset some portion of these costs to each impacted party. The purpose of this chapter is to summarize the primary revenue impacts of future development on the barrier islands, particularly in regard to St. Lucie County and the City of Fort Pierce.

The primary existing source of revenue resulting from real estate development on the islands is ad valorem taxation. Property tax millage rates are applied to certified assessments of real property and personal property to determine annual tax revenues. These revenues are then used to support general government administration, public safety operations, the school board, public health facilities, the courts, and other miscellaneous revenue for special-purpose agencies such as the port authority, the fire district, erosion and mosquito control, and regional water management. As development occurs, one-time fees are imposed to cover the costs of issuing building permits and inspecting electrical, plumbing, and structural systems of new buildings.

Additional, less significant revenue sources resulting from the permanent and "part-time" population on the islands include retail sales taxes and gasoline taxes collected by the State of Florida and "rebated" to the local jurisdictions (St. Lucie County and Fort Pierce) for specific purposes such as new road construction, general administration, and property tax relief. However, the degree of commercial development on the islands is limited, and expenditures for retail items and gasoline are made throughout the county. Because of the difficulty estimating the amount of such revenues resulting directly from development on the barrier islands, these sources have not been investigated in detail for this analysis.

In the following pages, the potential revenue-generation -- considering existing, or "in-place" sources -- of each alternative level of development described in Chapter III is evaluated. For each level of development--existing and approved, GMPP, Alternative 1, and Alternative 2 -- annual property tax revenues and one-time charges are estimated. If the costs of new development are to be borne locally, these sources will have to provide the bulk of the funding to cover public operating costs and necessary capital improvements. The last portion of this chapter briefly evaluates the public funding outlook for each development alternative.

EVALUATION OF POTENTIAL REVENUE SOURCES

The growth of future property tax revenues on the barrier islands will be a function of increases in real and personal property assessments and prevailing millage rates. Millage rates are determined annually as part of the budgeting process and depend upon the county (or city) funding requirements and the

certified assessment roll. Millage rates are expressed herein as follows per thousand dollars of assessed value (\$/1,000); in percentage terms, one mill equates to 0.1 percent. Because new millage rates for FY 82-83 have not been determined at the time of this analysis, current rates for FY 81-82 have been used throughout to determine future property tax revenues.

On the St. Lucie County barrier islands, increases in real property assessment values will continue to result primarily from new housing construction (on the south island property value includes major Florida Power and Light facilities). Tangible personal property includes automobiles, furniture and fixtures, equipment, and other assets contained within buildings, while real property includes the land and structures. Personal property value increases with new development, as well, normally averaging about ten percent of real property value (again, F.P. & L. is the exception).

For purposes of projecting gains in assessed value and resulting tax revenues, alternative levels of residential development have been used as a benchmark. The underlying assumption is that residential and commercial development, as well as land values, will continue to expand in the same basic relationships as recent trends have indicated. The immensely valuable F.P. & L. facilities are treated independently of these relationships.

Residential Growth Forecasts

In Chapter III, existing, approved, and alternative future levels of development are described for the barrier islands. In each case, the number of residential units (including manufactured units and hotel rooms) are estimated for the unincorporated areas of the north and south islands and the City of Fort Pierce. As of early 1982, there were 8,167 units existing on the islands, 2,509 of which were within the city limits of Fort Pierce. An additional 6,892 units have already been approved for development and are considered "committed" future inventory. It is assumed that these units have already been considered in public facilities planning. It is the impact of development above and beyond the "existing and approved" inventory that is the concern of this analysis.

Briefly, the GMPP (build-out) estimate assumes the maximum level of development allowable under the existing policies of the adopted growth management policy plan of St. Lucie County. In this scenario, up to 26,898 additional units could be built on the islands, bringing the total residential inventory to 41,957 units. This level of development would require a very substantial public investment in roads, bridges, water-sewer facilities and public safety.

Alternative 1 is predicated on the assumption that a new mid-point bridge might not be built to the south island. As a result, future development is constrained by transportation system capacity. Alternative 1 allows a total of 12,518 units, bringing the total on the islands to a maximum of 27,577 units.

Alternative 2 is even more constrained than Alternative 1 (except for Fort Pierce). Predicated upon the assumption that no bridge improvements are made at all, this alternative allows a maximum of 20,392 units, only 5,333 units above the existing and approved inventory on the barrier islands.

TABLE VII-1
BARRIER ISLANDS DWELLING UNIT SUMMARY

<u>PROJECTED INVENTORY</u>	<u>NORTH ISLAND</u>	<u>SOUTH ISLAND</u>	<u>FORT PIERCE</u>	<u>TOTAL STUDY AREA</u>
Existing-(1982)	1,232	4,426	2,509	8,167
Approved	+ 2,314	+ 3,522	+ 1,056	+ 6,892
Subtotal	(3,546)	(7,948)	(3,565)	(15,059)
GMPP	12,329	22,373	7,255	41,957
Alternative 1	9,457	11,822	6,298	27,577
Alternative 2	4,346	8,791	7,255	20,392
Increase *:				
GMPP	+ 8,783	+14,425	+ 3,690	+26,898
Alternative 1	+ 5,911	+ 3,874	+ 2,733	+12,518
Alternative 2	+ 800	+ 843	+ 3,690	+ 5,333

* Above existing and approved

Forecasts of Assessed Valuation

Future increases in property tax revenues will depend upon either gains in the assessed valuation of real and personal property on the barrier islands or increases in tax rates. In this analysis it is assumed that millages remain constant at FY 81-82 levels. Future revenues will then depend upon increases in the assessed valuation (tax roll) resulting from new development on the islands. The tax roll is periodically reassessed to reflect increased market value of existing properties. All forecasts of value in the following pages are made in terms of constant 1982 dollars, thus eliminating the impact of inflation. Since reassessments are intended to compensate for erosion in the tax roll resulting from inflation, it has been assumed that the existing tax roll will simply maintain its current value vis a' vis inflation over time. No allowance for gains above the inflation rate have been included (in other words, a \$100,000 property in today's market will increase in value at a rate neither more nor less than the inflation rate, as measured by the consumer price index).

Estimating future potential assessed valuation on the barrier islands is a complicated and inexact process. A careful analysis of the existing tax roll and specific project data was undertaken to allow for reasonably accurate projections. Future estimates are based upon average increments of total assessed value created by the addition of new housing units. These increments were determined in large part by the existing relationships between the housing inventory and the real property assessed value. The county taxable and school taxable valuations were averaged to yield a figure that could be projected. Projections of tangible personal property value are determined as a proportion of the gain in total real property value.

In the current fiscal year (FY 81-82), the total just value (or market value) of real property on the barrier islands is certified by the county assessor's office to be \$463,754,640. The total taxable value (average of school taxable

and county taxable) is estimated to be \$436,572,700. The difference is accounted for by household exemptions, publically owned property, or other legitimate exclusions. The F.P. & L. nuclear power plant accounts for \$134,552,920, or roughly 30 percent of the total (60 percent of the unincorporated south island).

Current estimates of tangible personal property value are based upon a ratio of ten percent of real property value. In addition, the F.P. & L. power plant represents \$197,285,490 in taxable personal property value. Total taxable personal property value on the barrier islands is estimated to be \$236,277,400 for FY 81-82.

The total barrier islands tax roll (real and personal property) against which ad valorem millages are levied is approximately \$672,850,100 in FY 81-82. This value includes improved and unimproved land; all residential, commercial, and other buildings; all mobile homes and recreational vehicles; furnishings and equipment; automobiles; the F.P. & L. plant; and other miscellaneous property.

To estimate future levels of assessed values, an average increment per new housing unit has been utilized for real property with a ten percent add-on for personal property. For the north island, an average of \$110,000 (1982 dollars) of real property assessed value has been added for each new permanent housing unit added under the three alternative development levels. This figure is consistent with recent assessment experience and is roughly equal to the average assessed value per unit ratio that exists on the north island at this time. An average of \$11,000 per unit has been added for personal property value. Utilizing these assumptions, it is projected that the assessed valuation of the north island could reach \$1,421,120,000 under the GMPP; \$1,072,882,300 under Alternative 1; and, \$454,451,300 under Alternative 2 (all figures in constant 1982 dollars).

To project future assessed valuation on the south island, a lower figure of \$80,000 per unit has been utilized. This reflects not only a market judgment concerning the relative value of new units built, but also a difference in existing relationships between total assessed valuation and residential units. On the south island there is a much higher proportion of recreational vehicles, mobile homes, older single-family housing, and undeveloped land. After allowing for temporary units and values represented by the nuclear power plant, average assessed valuation per unit is much lower in Fort Pierce and on the south island than on the north island. Personal property valuation is projected to increase by \$8,000 per new residential unit. Utilizing these assumptions, the total projected assessed valuation of the unincorporated portion of the south island could reach \$2,057,207,200 under the GMPP alternative; \$1,128,895,200 under Alternative 1; and, \$861,991,200 under Alternative 2.

In the Fort Pierce portion of the south island, the total projected assessed valuation could reach \$537,885,500 under GMPP and Alternative 2; and, \$453,669,500 under Alternative 1.

TABLE VII-2
ESTIMATED ASSESSED VALUATION
ST. LUCIE COUNTY BARRIER ISLANDS

	<u>NORTH ISLAND</u>	<u>SOUTH ISLAND</u>	<u>FORT PIERCE</u>	<u>TOTAL STUDY AREA</u>
<u>Existing (FY 81-82):</u>				
Real Property	\$ 69,093.0	\$ 258,172.9	\$109,306.8	\$ 436,572.7
Personal Property	<u>8,564.3</u>	<u>216,782.4 *</u>	<u>10,930.7</u>	<u>236,277.4</u>
Total	\$ 77,657.3	\$ 474,955.3	\$120,237.5	\$ 672,850.1
<u>Existing and Approved:</u>				
Real Property	\$ 323,633.0	\$ 536,660.9	\$193,786.8	\$1,054,080.7
Personal Property	<u>34,018.3</u>	<u>251,146.3</u>	<u>19,378.7</u>	<u>304,543.3</u>
Total	\$ 357,651.3	\$ 787,807.2	\$213,165.5	\$1,358,624.0
<u>GMPP:</u>				
Real Property	\$1,290,423.0	\$1,690,660.9	\$488,986.8	\$3,470,070.7
Personal Property	<u>130,697.3</u>	<u>366,546.3</u>	<u>48,898.7</u>	<u>546,142.3</u>
Total	\$1,421,120.3	\$2,057,207.2	\$537,885.5	\$4,016,213.0
<u>Alternative 1:</u>				
Real Property	\$ 973,843.0	\$ 846,740.9	\$412,426.8	\$2,233,010.7
Personal Property	<u>99,039.3</u>	<u>282,154.3</u>	<u>41,242.7</u>	<u>422,436.3</u>
Total	\$1,072,882.3	\$1,128,895.2	\$453,669.5	\$2,655,447.0
<u>Alternative 2:</u>				
Real Property	\$ 411,633.0	\$ 604,100.9	\$488,986.8	\$1,504,720.7
Personal Property	<u>42,818.3</u>	<u>257,890.3</u>	<u>48,898.7</u>	<u>349,607.3</u>
Total	\$ 454,451.3	\$ 861,991.2	\$537,885.5	\$1,854,328.0

* Includes F.P. & L. plant in TZ S-4

Note: All figures in 000's of constant 1982 dollars.

Forecasts of Ad Valorem Tax Revenue

Based upon current (FY 81-82) millage rates and the existing total assessed valuation, it is estimated that a total of \$9,339,260 in ad valorem taxes is levied against real and personal property on the barrier islands. These taxes flow to all taxing agencies, including the county general fund; the city of Fort Pierce; the school board; the port-airport authority; the South Florida Water Management District (SFWMD); the fire district; and mosquito/erosion control agencies. Of this total, roughly 35 percent goes to the county for the general fund, road maintenance, courts and law enforcement, and public health; roughly 42 percent goes to the school board; roughly 5 percent goes to the general fund of Fort Pierce; and the remaining 18 percent goes to the other special-purpose agencies named above.

Existing millage rates in effect for the barrier islands and used in this analysis are as follows:

St. Lucie County- General Fund	2.1476 mills
Transportation Trust	0.2144 mills
Fine & Forfeitures	2.3471 mills
Public Health	0.0334 mills
Subtotal - County	(4.7425 mills)
School Board -	5.6473 mills
City of Fort Pierce - General Fund	3.7758 mills
Other - Port & Airport Authority	0.0461 mills
Fire District	1.8360 mills
SFWMD	0.3580 mills
Mosquito Control	0.2548 mills
Erosion Control	0.0189 mills
Subtotal - Other	(2.5138 mills)
Total Millage - Incorporated	16.6794 mills
Unincorporated	12.9036 mills

A key assumption of this analysis is the continued use of these current millage rates to estimate future tax revenues. Obviously, any increase or reduction in city or county millages will impact estimates of future revenues. Based upon this assumption, it is projected that the existing and approved level of development will generate an annual ad valorem tax revenue for all purposes of \$18,405,980, almost twice the existing revenue base. This is the result of the projected doubling of assessed valuation indicated in Table VII-2. Approximately 55 percent of this total will be generated by development on the south island, including about \$4,300,000 in taxes paid by F.P. & L. for the power plant.

The GMPP level of full build-out could generate up to \$53,908,280 annually in ad valorem taxes at current millage rates. Under this alternative, total county receipts would increase about \$15,807,700 annually over existing levels; city receipts would increase about \$1,577,000 annually.

TABLE VII-3

ESTIMATED FUTURE AD VALOREM TAX REVENUES
ST. LUCIE COUNTY BARRIER ISLANDS

<u>TAXING AGENCY</u>	<u>EXISTING</u>	<u>EXISTING & APPROVED</u>	<u>GMPP</u>	<u>ALTERNATIVE 1</u>	<u>ALTERNATIVE 2</u>
County:					
General Fund	\$ 1,479,810	\$ 2,930,740	\$ 8,638,160	\$ 5,715,820	\$ 3,995,350
Transportation Trust	147,730	292,590	862,380	570,630	398,860
Fine & Forfeiture	1,617,270	3,203,000	9,440,620	6,246,780	4,366,460
Public Health	23,020	45,590	134,350	88,910	62,140
Subtotal	(\$ 3,267,830)	(\$ 6,471,920)	(\$19,075,510)	(\$12,622,140)	(\$ 8,822,810)
School	\$ 3,891,290	\$ 7,706,710	\$22,714,900	\$15,030,260	\$10,506,080
Other:					
Port & Airport	\$ 31,770	\$ 62,910	\$ 185,440	\$ 122,700	\$ 85,780
Fire District	1,265,100	2,505,550	7,384,890	4,886,520	3,415,660
SFMD	246,690	488,580	1,439,990	952,850	666,050
Mosquito Control	175,570	347,730	1,024,880	678,150	474,050
Erosion Control	7,010	17,680	51,670	37,890	25,720
Subtotal	(\$ 1,726,140)	(\$ 3,422,450)	(\$10,086,870)	(\$ 6,678,110)	(\$ 4,667,260)
City General Fund	\$ 454,000	\$ 804,900	\$ 2,031,000	\$ 1,712,960	\$ 2,030,950
TOTAL TAXES	\$ 9,339,260	\$18,405,980	\$53,908,280	\$36,043,470	\$26,027,100

NOTE: All figures in constant 1982 dollars; assumes current (FY 81-82) millage rates

Alternative 1 level of development could generate up to \$36,043,470 annually in ad valorem taxes to all agencies. The county would realize an increase of \$9,354,300 annually over existing levels; the city would realize an increase of \$1,259,000 annually.

Alternative 2 level of development could generate up to \$26,027,100 annually of all ad valorem taxes at current millage rates. Under this most constrained alternative, the county would realize an increase of \$5,615,000 annually over existing revenues, the city would gain \$1,577,000 annually in revenues from the islands.

Estimated One-Time Revenues

In addition to annual tax revenues generated directly by new developments on the barrier islands, there are one-time charges for permits and inspections levied against all new construction. These fees are based upon estimated construction costs and are paid at the time permits for construction are obtained. Although these potential revenues are identified here, it is assumed that they are sufficient only to cover the county's actual expenses of administering and conducting inspections to insure that building code requirements are met. No net revenue available to cover future operating or debt service needs are anticipated from these one-time charges.

For purposes of estimating permit fees, it has been assumed that construction costs per unit will equal roughly 60 percent of just value -- \$66,000/unit on the north island and \$48,000/unit on the south island. This also accounts for the fact that future development will be multi-family housing and that permits are issued for buildings and not units. The estimated per unit permit fees are as follows:

	North Island	South Island
Average Unit Cost	\$66,000/unit	\$48,000/unit
Building Permit	\$ 170/unit	\$ 131/unit
Plumbing Permit	\$ 35/unit	\$ 35/unit
Electrical Permit	\$ 10/unit	\$ 10/unit
Air Conditioning Permit	\$ 10/unit	\$ 10/unit
Total Permit	\$ 225/unit	\$ 186/unit

It is estimated that the approved level of development will generate about \$1,372,200 in one-time charges for the county. Under the GMPP alternative, one-time charges will total \$5,345,600. Under Alternative 1 and Alternative 2, one-time charges could total \$2,558,900 and \$1,023,100, respectively.

TABLE VII-4
ESTIMATED ONE-TIME REVENUES

<u>DEVELOPMENT ALTERNATIVE</u>	<u>ADDITIONAL DWELLING UNITS</u>	<u>PERMIT FEES</u>	<u>ONE-TIME REVENUES</u>
Approved:			
North Island	2,314	\$225/unit	\$ 520,700
South Island *	<u>4,578</u>	<u>\$186/unit</u>	<u>851,500</u>
Total	6,892		\$1,372,200
GMPP:			
North Island	8,783	\$225/unit	\$1,976,200
South Island *	<u>18,115</u>	<u>\$186/unit</u>	<u>3,369,400</u>
Total	26,898		\$5,345,600
Alternative 1:			
North Island	5,911	\$225/unit	\$1,330,000
South Island *	<u>6,607</u>	<u>\$186/unit</u>	<u>1,228,900</u>
Total	12,518		\$2,558,900
Alternative 2:			
North Island	800	\$225/unit	\$ 180,000
South Island	<u>4,533</u>	<u>\$186/unit</u>	<u>843,100</u>
Total	5,333		\$1,023,100

* Includes Fort Pierce

Other Revenue Sources

Property taxes and one-time fees are the primary "in-place" revenue sources that will be directly impacted by and attributable to new development on the barrier islands. The remaining sources of revenue are limited to revenue-sharing from the federal or state government. User-charges for water or sewer service flow to independent utilities and not directly to either the city or the county.

Federal revenue-sharing will not increase significantly as a result of new, market-rate development on the islands. State revenue-sharing is primarily a rebate on gasoline taxes (for road construction) and retail sales taxes (for the general fund). Both gasoline sales and retail sales are determined on a jurisdictional basis and would not be limited to the islands. These resources are relatively small and projection of their growth is beyond the scope of this analysis.

New revenue sources which might be established to help fund necessary additional capital or operating costs are addressed in later pages. Briefly, potential alternatives might include:

- . State grants -- although the current state administration is on the record as generally opposed to funding major improvements on barrier islands, some help may be available for projects that promote needed economic development.
- . Tolls or user-charges -- to offset some portion of operating expenses, user-charges or tolls could be used for sewerage or bridge facilities.
- . Special districts -- to provide special-purpose facilities or services that clearly benefit property owners, special districts could be established (by ordinance or legislative action) that raise revenues through additional property assessments. Municipal service taxing units (MSTU) or community development districts (CDD) are examples of such vehicles authorized by Florida Statutes.
- . Impact fees -- impact fees could be instituted by the county (or city) and applied to each new construction project to raise funds needed to offset capital requirements for new public facilities.

Summary of Revenue Impacts

The public costs identified in this report and summarized in the following pages address new facilities required to accommodate alternative levels of development beyond the "existing and approved" level. In TABLE VII-5, additional "in-place", direct public revenues that will result from these incremental development alternatives are summarized. If additional development occurs to the full extent currently permissible under the GMPP, total additional annual revenues to all taxing agencies will increase by \$35,502,300 (beyond existing and approved). One-time revenues will total \$5,345,600.

Under Alternative 1, total annual property tax revenues will increase \$17,637,490, and one-time revenues will total \$2,558,900.

Under Alternative 2, total annual property tax revenues will increase \$7,621,120, and one-time revenues will total \$1,023,100.

TABLE VII-5
RELATIVE REVENUE IMPACTS, BARRIER
ISLANDS DEVELOPMENT ALTERNATIVES

	<u>GMPP</u>	<u>ALTERNATIVE 1</u>	<u>ALTERNATIVE 2</u>
<u>Additional Dwelling Units:</u>			
North Island	8,783	5,911	800
South Island	14,425	3,874	843
Fort Pierce	<u>3,690</u>	<u>2,733</u>	<u>3,690</u>
Total	26,898	12,518	5,333
<u>Additional Assessed Value *:</u> (000's)			
North Island	\$ 1,063,469	\$ 715,231	\$ 96,800
South Island	1,269,400	341,088	74,184
Fort Pierce	<u>324,720</u>	<u>240,504</u>	<u>324,720</u>
Total	\$ 2,657,589	\$ 1,296,823	\$ 495,704
<u>Additional Tax Revenues *:</u>			
North Island	\$13,722,570	\$ 9,229,050	\$1,249,060
South Island	16,363,620	4,397,000	955,950
Fort Pierce	<u>5,416,110</u>	<u>4,011,440</u>	<u>5,416,110</u>
Total	\$35,502,300	\$17,637,490	\$7,621,120
<u>One-Time Revenues:</u>			
North Island	\$ 1,976,200	\$ 1,330,000	\$ 180,000
South Island	2,683,100	720,600	156,800
Fort Pierce	<u>686,300</u>	<u>508,300</u>	<u>686,300</u>
Total	\$ 5,345,600	\$ 2,558,900	\$1,023,100

* Assessed value and annual tax revenue generated by development above and beyond "existing and approved" levels; taxes include school taxes and all others to city and county.

ANALYSIS OF ALTERNATIVE DEVELOPMENT LEVELS

Each of the three alternative development levels has associated public cost factors for capital and operating needs. In most cases it is assumed that "local" resources will be required to pay for improved transportation, public safety, and water-sewer facilities needed to accommodate development above "existing and approved" levels. It is assumed in this analysis that capital and operating needs associated with already approved developments have been considered during the site plan approval process and that necessary public investment has been previously committed.

As presented in the preceding pages, each development alternative has a potential revenue impact to the county or city. The purpose of this section is to compare anticipated costs of each development alternative with the estimated revenue potential of each, and to evaluate possible public funding strategies to accommodate the development projected to occur. While this analysis does not represent a comprehensive public investment program and is predicated upon a set of assumptions governed in large part by recent data trends, it does illustrate the order of magnitude to be anticipated in terms of costs, revenues, and their relationships.

It is clear that under the GMPP alternative and Alternative 1, the public investment needed to comfortably accommodate private development far exceeds the capacities of traditional, "in-place" funding vehicles such as capital budgeting and municipal bond financing. Additional means of raising capital -- particularly for bridge improvements and sewerage facilities -- used elsewhere in the state but new to St. Lucie County, will have to be implemented. To a large degree, the additional costs of the necessary public facilities will have to be borne by new and existing property owners who will benefit the most from the new facilities. Barring a substantial increase of state or federal money to assist with the construction of bridge improvements or sewerage facilities, it appears that special assessment districts and/or impact fees will be required on the islands to pay for the major portion of these improvements.

Summary of Public Facilities Costs

The most "expensive" alternative is GMPP, which will permit more than twice the additional development projected for Alternative 1, and five times the development projected for Alternative 2. Total capital costs for the county and/or city to accommodate additional transportation, public safety, and sewerage improvements required under GMPP are projected to total about \$75,150,000 (1982 dollars). Almost 80 percent of this total is for transportation, including roughly \$31,000,000 for a new mid-point bridge to the south island and \$14,000,000 in other improvements to existing bridges. The provision of regional sewerage treatment and transmission facilities to serve the unincorporated areas of the north and south island are projected to require about \$11,700,000. It is assumed that additional water supply capacity and transmission mains will be provided by a combination of existing utility companies and private developers, without a net additional cost to the county or city governments. The costs of providing additional

fire stations, vehicles, and other public safety equipment under GMPP are projected to total \$3,900,000.

The projected public costs of Alternative 1 total roughly \$32,250,000, only 45 percent of GMPP. The primary difference is that Alternative 1 assumes that no new bridge is built to the south island. Thus, the required investment in transportation facilities is reduced to \$20,610,000 representing about 64 percent of the total public costs of this alternative. The reduced level of residential development under this alternative requires a smaller investment in both public safety and sewerage facilities -- \$2,590,000 and \$9,050,000, respectively.

The most constrained and "least expensive" development level is Alternative 2. Under this alternative, no bridge improvements at all are provided and transportation improvements are limited to selected widening of AIA and intersection improvements in the existing developed areas of Fort Pierce and the north island. Public investment in transportation improvements are estimated to total \$2,490,000 or 62 percent of the total necessary public investment. Because the level of new development in the unincorporated areas is so constrained, there is no need to provide regional sewerage treatment facilities, thus there is no cost for this in Alternative 2. The total public investment projected to accommodate this alternative is \$3,980,000.

Table VII-6 summarizes the estimated public investment required for each alternative.

In addition to capital requirements for new public facilities, there will be annual operating and maintenance (O&M) costs associated with each development alternative. Some of these costs will be covered by regular user-charges (sewer service), but some will have to be paid from county and/or city tax revenues. Transportation O & M is very difficult to estimate and has not been provided for in this analysis. It is assumed that property tax revenues collected for the county's transportation trust fund (0.2144 mills in FY 81-82) and 5th and 6th cent gas tax will cover the cost of additional transportation O & M on the barrier islands. It is also assumed that monthly user-charges to customers will cover the costs of sewer service.

In public safety, annual O & M expenditures will include manpower and equipment maintenance. The annual increment in operating expenses have been estimated for each alternative and are summarized in Table VII-7.

Table VII-8 summarizes the relative capital and operating costs of each alternative development level with a per-unit basis comparison.

TABLE VII-6
SUMMARY OF CAPITAL EXPENDITURE REQUIREMENTS

	<u>GMPP</u>	<u>ALTERNATIVE 1</u>	<u>ALTERNATIVE 2</u>
<u>North Island *:</u>			
Transportation	\$11,590,000	\$ 9,770,000	\$ 120,000
Public Safety	1,250,000	1,180,000	110,000
Sewerage	4,800,000	4,150,000	-
Subtotal	(\$17,640,000)	(\$15,100,000)	(\$ 230,000)
<u>South Island *:</u>			
Transportation	\$46,350,000	\$ 9,210,000	\$ 810,000
Public Safety	2,440,000	1,230,000	1,170,000
Sewerage	6,900,000	4,900,000	-
Subtotal	(\$55,690,000)	(\$15,340,000)	(\$1,980,000)
<u>Fort Pierce:</u>			
Transportation	\$ 1,610,000	\$ 1,630,000	\$1,560,000
Public Safety	210,000	180,000	210,000
Sewerage	-	-	-
Subtotal	(\$ 1,820,000)	(\$ 1,810,000)	(\$1,770,000)
<u>Summary:</u>			
Transportation	\$59,550,000	\$20,610,000	\$2,490,000
Public Safety	3,900,000	2,590,000	1,490,000
Sewerage	11,700,000	9,050,000	-
Total	\$75,150,000	\$32,250,000	\$3,980,000

Notes: (1) all figures in constant 1982 dollars; (2) water treatment and transmission facilities provided through independent utilities and, therefore, they are excluded from this table.

* unincorporated area

TABLE VII-7
ANNUAL PUBLIC SAFETY OPERATING COSTS

	<u>GMPP</u>	<u>ALTERNATIVE 1</u>	<u>ALTERNATIVE 2</u>
North Island	\$1,260,000	\$1,020,000	\$ 370,000
South Island	\$2,320,000	\$1,210,000	\$ 980,000
Fort Pierce	\$ 890,000	\$ 800,000	\$ 890,000
Total	\$4,470,000	\$3,030,000	\$2,240,000

TABLE VII-8
RELATIVE COST IMPACT OF BARRIER ISLANDS DEVELOPMENT

	<u>GMPP</u>	<u>ALTERNATIVE 1</u>	<u>ALTERNATIVE 2</u>
<u>Additional Units *:</u>			
North Island	8,783	5,911	800
South Island	14,425	3,874	843
Fort Pierce	<u>3,690</u>	<u>2,733</u>	<u>3,690</u>
Total	26,898	12,518	5,333
<u>Additional Capital Costs **:</u>			
North Island	\$17,640,000	\$15,100,000	\$ 230,000
South Island	55,690,000	15,340,000	1,980,000
Fort Pierce	<u>1,820,000</u>	<u>1,810,000</u>	<u>1,770,000</u>
Total	\$75,150,000	\$32,250,000	\$3,980,000
<u>Capital Costs Per Unit **:</u>			
South Island	\$ 2,008	\$ 2,554	\$ 287
North Island	3,861	3,960	2,349
Fort Pierce	493	662	480
Average	\$ 2,794	\$ 2,576	\$ 746
<u>Operating Costs Per Unit ***:</u>			
North Island	\$ 143	\$ 173	\$ 463
South Island	161	312	1,162
Fort Pierce	241	293	241
Average	\$ 166	\$ 242	\$ 420

* above existing and approved

** transportation, public safety, sewerage

*** public safety only

Alternative Funding Strategies

As noted earlier, it is extremely unlikely that the required public facilities needed to accomodate future levels of development under GMPP and Alternative 1 can be funded through traditional, "in-place" means without substantial assistance from external sources such as the state or federal governments. Assuming such external assistance is not forthcoming, new vehicles must be implemented to provide additional one-time and/or recurring annual revenue sources. One-time sources could include impact fees or hook-up charges; recurring sources could include special-purpose tax assessments or tolls/user-charges. Traditional sources available include permit fees and ad valorem property taxes. Tax revenues could be used to fund annual budget appropriations or to amortize long-term debt obligations, such as bonds issues.

In the following pages, general alternative strategies to meet projected funding shortfalls are evaluated for each of the alternative future development levels.

GMPP - This alternative requires the greatest public investment on the part of the county and/or city. A total of \$75,150,000 in capital funding is required, with an additional \$4,470,000 required annually for operating expanded public safety facilities. All of the additional property tax revenues identified in TABLE VII-3 will not be available to pay for these improvements. For this analysis, it is assumed that only some portion of the taxes flowing to the county and city general funds can be used to meet these capital and operating costs. Transportation trust fund revenues will be used to offset O & M costs for improved roads and bridges.

For purposes of this analysis, additional tax revenues to be realized above the estimated existing levels are used to determine funding capacity. The GMPP level of development will generate an additional \$7,158,350 annually for the county general fund and \$1,577,000 annually for the city general fund, totaling \$8,735,350 annually when considered together. After allowing for increased public safety operating expenses of \$4,470,000 annually, a net increase of \$4,265,350 would be realized at full development of the islands.

At least half of the identified net revenue will be needed to provide for general countywide administrative expenses, leaving a maximum revenue of \$2,130,000 annually available to retire long-term general obligation debt. Assuming a debt coverage ratio of 1.3, 12 percent interest, and a 25-year term, this level of annual revenue could support about \$12,000,000 to \$13,000,000 of bonded indebtedness, at best. This provides only about 17 percent of the required public investment for the GMPP alternative, and leaves a capital "shortfall" of about \$62,000,000.

If a community development district (CDD), municipal services taxing unit (MSTU), or other special district were established on the islands with the authority to levy additional taxes, revenues could be generated and used to amortize additional capital debt for required public facilities which benefit all property owners. For example, a three-mill levy against all real property could generate as much as \$10,000,000 annually in new tax revenues, which could support \$62,000,000 in capital debt. This assessment would equate to roughly \$240 annually per dwelling unit at full development levels.

An alternative to island-wide assessments is to assess new developments with per-unit impact fees designed to offset the incremental capital cost of new public facilities. If in-place funding vehicles left a capital shortfall of \$62,000,000 and no new tax revenues were developed, the average per-unit impact fee required could be as much as \$2,250 to cover transportation, public safety, and sewerage investments under GMPP. This could add three to four percent to the cost of new dwelling units on the islands.

It seems most appropriate that, under GMPP, traditional funding be utilized to provide public safety and some transportation improvements. The costs of providing regional sewerage facilities might best be funded through a special district (CDD or MSTU) which taxes equally existing and new

development benefitting from improved services. To fund \$11,700,000 in capital improvements a levy of about 0.6 to 0.8 mills would be required for property in the unincorporated county areas of the islands. Extraordinary transportation improvements (such as new bridges) that are required as a result of high levels of new development might best be funded through impact fees, averaging about \$1,800 to \$1,900 per new dwelling unit.

Alternative 1- This alternative requires a total public investment of \$32,250,000 only 43 percent of GMPP totals. It is somewhat more advantageous fiscally, because it allows 47 percent of the GMPP dwelling unit total and 63 percent of the potential tax revenue generated by the GMPP alternative. No new bridge is required, which significantly reduces the required investment in transportation improvements on the islands compared to GMPP.

Under Alternative 1, it is estimated that about \$4,236,010 annually in additional property taxes will flow to the county's general fund from new island development. For the city, additional tax revenues are estimated to be \$1,258,960 annually. This total additional annual revenue of \$5,494,970 would be partially offset by \$3,030,000 of increased public safety operating expenses, leaving a net revenue flow of \$2,464,970 per year to the county and city. Once again, assuming that no more than half of this revenue could be allocated to amortize bonded indebtedness, a total of about \$7,000,000 to \$8,000,000 in public capital could be provided through in-place means to provide public improvements needed for Alternative 1. The resulting capital "shortfall" is approximately \$24,000,000.

If additional capital resources needed were raised through the establishment of an island-wide special district, a supplemental tax revenue of about \$4,000,000 annually would be required to amortize \$24,000,000. If applied to the projected real property assessed valuation presented for Alternative 1 in TABLE VII-2, an additional levy of about 1.8 mills would be required. This would average about \$145 annually for each dwelling unit.

If impact fees are utilized to provide the additional public capital needed (\$24,000,000), it is estimated that the average per-unit charge would have to be about \$1,900. This fee would be assessed against each new unit built beyond the existing and approved level. This amount would add about three percent to the cost of each new dwelling unit on the islands.

With Alternative 1, it seems most appropriate that traditional funding be used to pay for public safety and a portion of transportation improvements. It is likely that, in addition to general obligation debt, about \$14,000,000 to \$15,000,000 will need to be raised through impact fees, averaging \$1,100 to \$1,200 per new unit. Sewage treatment and transmission improvements could be funded through a special-purpose district, requiring an added levy of about 0.8 to 1.0 mills in the unincorporated county areas of the islands.

Alternative 2 - This alternative is severely constrained, allowing only a 35 percent gain in new development above existing and approved levels. Of this total, 69 percent of new development would occur in Fort Pierce, where much of the needed public service infrastructure is in-place at this time. Almost half of the total projected necessary public investment would be for transportation and public safety improvements within the city limits. A total of \$3,980,000 would be needed for public capital investments throughout

the islands; annual public safety operating expenses would increase \$2,240,000 per year.

Under Alternative 2, it is estimated that general fund tax revenues would increase \$2,515,540 annually for the county and \$1,576,950 annually for the city. The combined total of \$4,092,490 would be reduced by \$2,240,000 annually for increased operating costs. The net revenue to the two governments would be \$1,852,490 annually. Half of this net annual revenue would support \$5,000,000 to \$6,000,000 in bonded indebtedness, more than enough to cover the necessary public investment to accomodate the Alternative 2 level of development.

Summary - It is obvious that both the GMPP alternative and Alternative 1 will require "creative" public financing, introducing new revenue-generating approaches to St. Lucie County (and possibly to Fort Pierce). It is also clear that the burden of providing necessary public improvements will fall largely on existing and future property owners, requiring increased tax levies of as much as three mills, or impact fees that could total \$2,250 or more per unit. A balance will need to be found that assesses all property owners for services that benefit them and charges new units for major transportation improvements needed to accommodate their development.

The following table summarizes rough estimates of impact fees and special district assessments that might be required under differing public policy options for GMPP and Alternative 1.

TABLE VII-9
SUMMARY OF ALTERNATIVE CAPITAL FUNDING DEVICES

<u>Policy Options</u>	<u>GMPP</u>	<u>Alternative 1</u>
Special District Tax Only: *		
Millage required	3.0 mills	1.8 mills
Tax per unit **	\$ 240/d.u.	\$ 145/d.u.
Impact Fees Only: ***		
Cost per new unit	\$2,250/d.u.	\$1,900/d.u.
Suggested Funding Strategy:		
Tax millage required	0.6-0.8 mills	0.8-1.0 mills
Tax per unit	\$50-\$65/d.u.	\$65-\$80/d.u.
Impact fee per new unit	\$1,800 - \$1,900	\$1,100 - \$1,200/d.u.
* levied against all property owners in district		
** at full development		
*** charged only to new units beyond existing and approved		

CHAPTER VIII NATURAL ENVIRONMENT ANALYSIS

INTRODUCTION

The combined St. Lucie County and Fort Pierce area of Hutchinson Island exhibits a spectrum of natural communities typical of barrier islands on the east coast of Florida. A narrow sand beach parallels the Atlantic Ocean. Landward of the beach is a duneland system comprised of a narrow primary dune and coastal overwash area. Upland scrubland and mixed hammock forest dominate the upland areas landward of the dunelands and above the zone of active sand gain and loss. By far the largest community on the Island is the coastal mangrove system, occupying large areas of lower elevation at the fringe of the Indian River estuary and extending in some areas to the east of State Road A-1-A.

East of the natural communities on Hutchinson Island exhibits characteristically different suitabilities and sensitivities to land use. Some are highly unstable and susceptible to change; others are particularly sensitive to disturbance. Most are valuable aesthetic and recreation resources.

To protect and preserve the natural communities of Hutchinson Island requires a coordinated program of land development and natural resource management. Communities on the Island must be recognized in terms of the resources they provide, the hazards inherent in their use, and their relative limitations and suitabilities for development of various types and intensities. Guidelines for development as well as resource management strategies should reflect this understanding of the Island's natural systems.

The following Natural Environment Analysis for the St. Lucie County and Fort Pierce portions of Hutchinson Island is comprised of three sections. The first presents a brief description of the major natural communities on the Island. The second identifies problems and opportunities afforded by each for development. The final section presents development guidelines for the protection of the Island's natural resources during land development.

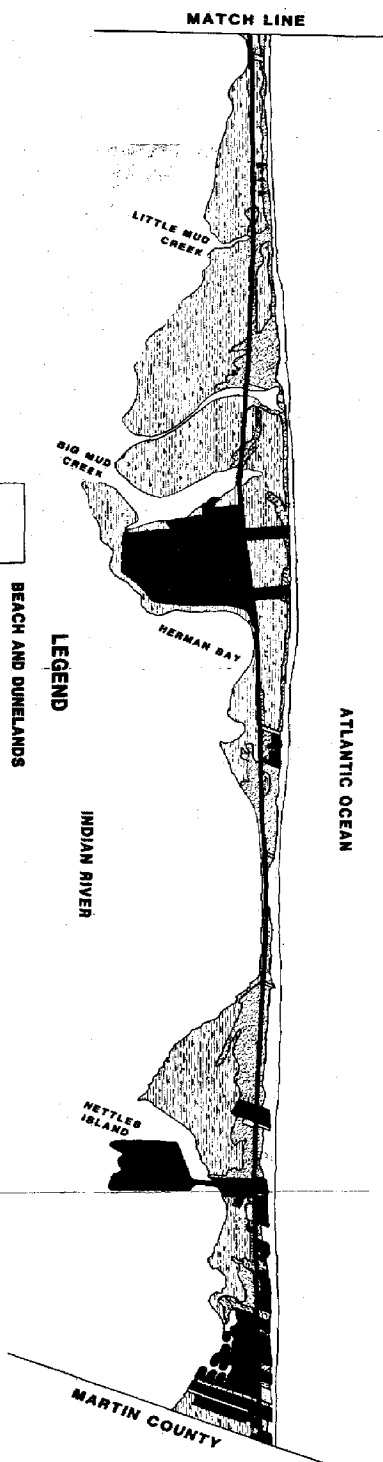
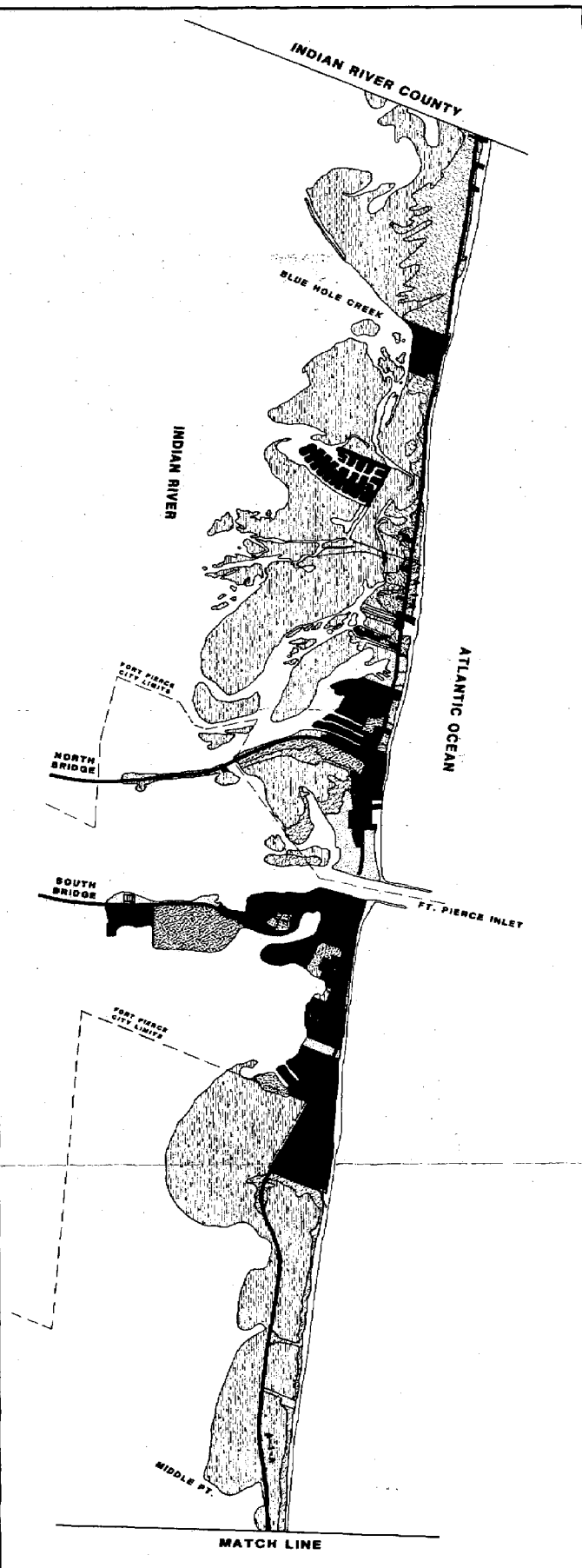
ENVIRONMENTAL ZONES

Introduction

Natural communities of the St. Lucie County and Fort Pierce portions of Hutchinson Island can be generally categorized into three environmental zones (Figure VIII-1), including:

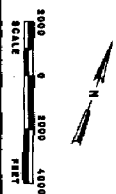
1. Beach and Dunelands.
2. Upland Areas.
3. Marsh and Mangrove Forest.

Identification of zones is based upon the combination of topographic position (elevation), soil, vegetation, and drainage conditions typical of each.



- LEGEND**
- BEACH AND DUNE LANDS
 - UPLANDS
 - MARSH AND MANGROVE FOREST
 - EXISTING DEVELOPED AREA
 - DEVELOPED PUBLIC PARKLAND
 - DISTURBED LAND

Note: Delineation of environmental zones subject to modification by detailed field survey of existing vegetation.



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ENVIRONMENTAL ZONES

The description and mapping of these zones has been performed on the basis of existing data describing environmental characteristics of the Island. Limited field surveying was also undertaken.

Beach and Dunelands

Ecological Features

The combined beach and duneland system on Hutchinson Island is the primary protective defense against coastal storms and flooding along the Atlantic shoreline.

The beach system is comprised of four zones:

Nearshore: The submerged beach extending seaward as far as the force of waves reaches to the bottom, often the point at which depths reach 40 to 50 feet.

Bar: The offshore ridge that may emerge at low tides but is submerged at least at high tides and often permanently.

Foreshore: The wet beach, lying adjacent to and below the backshore berms, and extending to the low-water mark.

Backshore: The dry beach, lying adjacent to and below the dunelands that is washed by waves at least once a year during normal storms and highest tides. It is made up of berms and flats formed by wave deposition of sand or gravel on the backshore.

On Hutchinson Island the foreshore and backshore zones - the beach areas of greatest impact from land development and recreational activity - form a relatively narrow unvegetated strip along the coast. The two zones, commonly taken to be "the beach", range from less than 100 feet to more than 500 feet in width; in most places their combined width is less than 200 feet. The shape and slope of the beach commonly change with storm events. Most beach areas have a uniform, gentle slope to the water's edge; others have wave-built ridges with short, stronger slopes ranging to 15 percent or more. Beach soils are comprised of pale brown to light grey sand grains of uncoated quartz mixed with multi-colored, sand-sized to 1 cm shell fragments. Few to many coarser shell fragments occur in all parts of the soil. Depth to the water table ranges from 0 to 6 feet or more.

The duneland system begins at the landward edge of the beach backshore, identified as the annual highest tide mark. From the beach backshore it extends landward, generally including the active dunes, sand ridges, troughs and flats subject to active gain or loss of sand because of sea wave action and wind. On Hutchinson Island in St. Lucie County and Fort Pierce, the duneland system is atypical of those found on many coastal barrier islands. In most areas it is characterized by a single primary dune. Along much of the northern portion of South Beach this primary dune is narrow and lies directly adjacent to the coastal mangrove zone; most of the North Beach area, and portions of South Beach below the Hutchinson Island Nuclear Power Plant, are characterized by a primary dune and landward overwash area lacking any defined parallel secondary dunes and ridges.

Soils of the primary dune are dominated by Palm Beach fine sand and Canaveral fine sand; overwash areas landward of the primary dune are dominated by Canaveral fine sand. Characteristics of the two soils are generally described in the St. Lucie County Soil Survey (U.S.D.A., Soil Conservation Service, March 1980) as follows:

Palm Beach Fine Sand:

Excessively well drained.
Rapid permeability.
Very low available water capacity.
Very low organic matter content and natural fertility.
Surface layer - Grayish brown fine sand, approximately 8 inches thick.
Underlying material - Pale brown fine sand in the upper 22 inches; light gray fine sand with multi-colored shell fragments below to a depth of 80 inches or more.

Canaveral Fine Sand:

Moderately well to somewhat poorly drained.
Very rapid permeability.
Very low available water capacity.
Very low organic matter content and natural fertility.
Surface layer - Dark brown fine sand approximately 6 inches thick.
Underlying material - Pale brown fine sand in the upper 28 inches.
Gray fine sand with many sand-size shell fragments to a depth of 80 inches or more.

Three distinct vegetation communities are characteristic of the dunelands:

Vine and Grass Zone:

Location - Immediately landward of the beach zone, extending up the seaward face of the primary dune.

Typical Plant Species -

Sea Oats	<i>Uniola paniculata</i>
Saltmeadow Cordgrass	<i>Spartina patens</i>
Dune Panic Grass	<i>Panicum amarulum</i>
Beach Bean	<i>Canavalia maritima</i>
Railroad Vine	<i>Ipomoea pes-caprae</i>
Morning Glories	<i>Ipomoea</i> spp.
Sea Rocket	<i>Cakile</i> spp.
Inkberry	<i>Scaevola plumieri</i>
Sea Blite	<i>Suaeda linearis</i>
Beach Elder	<i>Iva imbricata</i>
Dune Sunflower	<i>Helianthus debilis</i>
Camphorweed	<i>Hetrotheca subaxillaris</i>
Sea Purslane	<i>Sesuvium portulacastrum</i>
Beach Croton	<i>Croton punctatus</i>

Prickly Zone:

Location - Landward of the vine and grass zone on the sloping back edge of the primary dune and extending onto the overwash area.

Typical Plant Species -

Spanish Bayonet	<i>Yucca aloifolia</i>
Saw Palmetto	<i>Serenoa repens</i>
Sea Grape	<i>Coccoloba uvifera</i>
Prickly-Pear Cactus	<i>Opuntia stricta</i>
Cocoplum	<i>Chrysobalanus icaco</i>
Gray Nickerbean	<i>Caesalpinia bonduc</i>
Bamboo Vine	<i>Smilax</i> spp.
Gopher-Apple	<i>Licania michauxii</i>

Strand Zone:

Location - Narrow intermittent zone landward of the prickly zone.

Typical Plant Species -

Saw Palmetto	<i>Serenoa repens</i>
Wax Myrtle	<i>Myrica cerifera</i>
Woody Goldenrod	<i>Solidago pauciflosculosa</i>
Myrtle Oak	<i>Quercus myrtifolia</i>
Chapman's Oak	<i>Quercus chapmani</i>
Sea Myrtle	<i>Baccharis halimifolia</i> var. <i>angustior</i>

Large areas of the duneland system on the St. Lucie and Fort Pierce portions of Hutchinson Island have been disturbed as a result of land development and human activity. In Fort Pierce, and in the southernmost portions of South Beach and North Beach in St. Lucie County, construction has occurred up to the edge of the primary dune, occupying the majority of the overwash area. Large areas of undeveloped duneland remain along the northern section of North Beach and in the central portion of South Beach. There has, however, been significant disturbance to the dune system as a result of invasion by Australian Pine (*Casuarina* spp.) along most of the primary dune, particularly on South Beach.

Upland Areas

Ecological Features

On the St. Lucie County and Fort Pierce portions of Hutchinson Island upland scrubland and hammock forest has developed where old dunelands have become

thoroughly stabilized and are somewhat protected from salt spray by seaward layers of scrubby duneland vegetation.

The upland areas consist of two vegetative communities. An upland scrubland association, probably derived from strands on the lee side of old beach dunes, dominates upland areas on the South Beach. An upland mixed hammock association derived from old beach strands and wetland areas dominates upland areas on the North Beach.

Upland mixed hammock forest dominates the undeveloped upland areas of North Beach west of State Road A-1-A near the Indian River County/St. Lucie County boundary. Upland scrubland dominates the undeveloped upland areas of South Beach. These are concentrated in two locations: one immediately north of Blind Creek on State Road A-1-A; the other, in the vicinity of the Narrows and the areas just to the north and south of it.

Soils underlying both the upland scrubland and the mixed hammock forest are comprised primarily of moderately well to somewhat poorly drained Canaveral fine sand. These soils are characteristically very rapidly permeable, and have very low available water capacity, organic matter, and natural fertility. The soils are deep, in excess of 80 inches, pale brown and gray in color, and typically contain many sand-size shell fragments.

Plant species typical of the two vegetation communities include:

Upland Scrubland -

Cabbage Palm	<i>Sabal palmetto</i>
Sand Live Oak	<i>Quercus virginiana</i> var. <i>germinata</i>
Saw Palmetto	<i>Sabal palmetto</i>
Sea Grape	<i>Coccoloba uvifera</i>

Upland Mixed Hammock -

Redbay	<i>Persea borbonia</i>
Cabbage Palm	<i>Sabal palmetto</i>
Sand Live Oak	<i>Quercus virginiana</i> var. <i>germinata</i>

The upland scrubland is dominated by widely spaced cabbage palm (*Sabal palmetto*) and a dense understory primarily comprised of saw palmetto (*Serenoa repens*). By comparison the upland mixed hammock has a more densely developed canopy comprised of several tree species, generally 25 to 30 feet in height.

The majority of areas dominated by upland communities are located within the inundation area of the 100-year storm. They are, however, protected from the full force of the wave crest flood by the coastal beach and duneland system.

Extensive invasion by non-native plant species has occurred in upland areas along roadways and adjacent to disturbance areas. Australian Pine (*Casuarina spp.*) has grown up along both edges of State Road A-1-A where the land has been filled to provide elevation for the roadway. Several large

and dense Australian Pine communities have become established where development disturbed adjacent vegetation. Along roadways and the edges of disturbances there has also been considerable invasion by the Brazilian Pepper Tree (*Schinus terebinthifolius*).

Marsh and Mangrove Forest

Ecological Features

Mangrove forest and saltwater marshes comprise the major natural communities of the St. Lucie County and Fort Pierce portions of Hutchinson Island. Undeveloped areas west of State Road A-1-A extending to the submerged Indian River estuary are generally dominated by the two communities; exceptions occur primarily in the three major areas of upland hammock described above. On portions of South Beach the mangrove forest community extends east of State Road A-1-A, up to the strand of the duneland community.

The mangrove forest and saltwater marshes can be divided into two zones. The upper wetlands are located above the mean high water elevation and contain salt-tolerant plants that prosper in soil sporadically flooded by tides; typically they are dominated by black and white mangroves. The lower wetlands are located below the mean high water line and are regularly flooded by tides; typically they are dominated by red mangroves.

Dredging and filling to create uplands for development have eliminated some of the mangrove and marsh areas on the Island; the remaining areas have generally been ditched and diked throughout for mosquito control purposes. These activities have affected drainage patterns on the Island, in many areas stopping the movement of water from the river to the intertidal zone. By impounding these areas, tidal movement of detrital material from the impounded vegetation to lagoon waters has been precluded. In some areas water levels in the impoundments have covered the pneumatophores of black mangroves and the prop root lenticels of red mangroves killing the mature trees. Whether mosquito control activities have improved or diminished the overall productivity of the marsh and mangrove forest communities, however, is not documented.

Conclusions of the Florida Department of Environmental Regulation (DER) are that the majority of the marsh and mangrove forest areas on Hutchinson Island in Fort Pierce and St. Lucie County are naturally occurring. These conclusions are based upon DER's repeated experience in reviewing dredge and fill permit applications for areas on the Islands.¹ During review of these applications the DER Staff have studied soil borings, made field visits, and reviewed old aerial photographs of the Island taken prior to government mosquito control activities. Their conclusions indicate that while mosquito control measures have affected drainage patterns, there is adequate evidence regarding substrate conditions to indicate that the areas are generally naturally occurring marshes and mangrove forests.

¹Florida Department of Environmental Regulation, Dredge and Fill Permitting, Port St. Lucie.

The marsh and mangrove forest substrate is dominated by soils of the Pompano Variant - Kaliga Variant association. Generally Kaliga Variant soils are located in the center of marsh and mangrove forest areas where organic material is thickest; Pompano Variant soils are typically located on the outer edges. Characteristics of the two soils are generally described in the St. Lucie County Soil Survey (U.S.D.A., Soil Conservation Service, March 1980) as follows:

Pompano Variant Soils -

Very poorly drained.
Rapid permeability.
Low available water capacity.
Water table at or above the surface; flooded during normal high tides and storm periods.
Surface layer - Greenish gray fine sand, approximately 1 inch thick, underlain by dark gray fine sand, approximately 7 inches thick. Entire surface layer overlain by 1 inch of undecomposed leaves and twigs.
Underlying material - Gray fine sand in the upper 24 inches; greenish gray fine sand with shell fragments below to a depth of 80 inches or more.

Kaliga Variant Soils -

Very poorly drained.
Rapid permeability in organic layer; slow permeability in substratum.
High available water in organic layer; medium available water in substratum.
Water table at or above the surface; flooded during normal high tides and storm periods.
Surface layer - Black muck, approximately 35 inches thick.
Underlying material - Dark grayish brown sandy clay loam, approximately 17 inches thick.

Areas of both soil series are large enough to map separately. However the Soil Conservation Service did not separate the two series because of the difficulty of mapping due to dense vegetation and flooding.

Most of the vegetation of the marsh and mangrove forest areas on Hutchinson Island is generally described in An Inventory of the Saltmarsh Mosquito Control Impoundments in Florida (Florida Medical Entomology Laboratory, March 1978). This inventory indicates the following typical plant species in the marsh and mangrove forest areas in St. Lucie County and Fort Pierce:

Tree Species -

White Mangrove
Black Mangrove
Red Mangrove
Button Wood

Laguncularia racemosa
Avicennia germinans
Rhizophora mangle
Conocarpus erectus

Shrubs, Vines and Ferns -

Christmas Berry	<i>Lycium carolinianum</i>
Wax Myrtle	<i>Myrica cerifera</i>
Saltbush	<i>Baccharis halimifolia</i> var. <i>angustior</i>
Sea Oxeye	<i>Borrichia frutescens</i>
Saltwort	<i>Batis maritima</i>
Leather Fern	<i>Acrostichum danaeae-folium</i>

Grasses and Herbs -

Smooth Cordgrass	<i>Spartina alterniflora</i>
Perennial Glasswort	<i>Salicornia virginica</i>
Sea Lavendar	<i>Limonium carolinianum</i>
Annual Glasswort	<i>Salicornia bigelovii</i>
Sea Purslane	<i>Sesuvium portulacastrum</i>
Water Smartweed	<i>Persicaria punctata</i>
Duckweed	<i>Lemna</i> spp.
Sawgrass	<i>Cladium jamaicensis</i>
Sea Blite	<i>Dondia maritima</i>

Red mangrove is the main component of the marsh and mangrove forest areas on both North Beach and South Beach, forming large expanses of almost pure stands. The red mangrove occurs at the water's edge and generally below the mean high water line. Typically it grows as a shrub or small tree. Numerous prop roots or pneumatophores extend from the trunk of the tree, anchoring it to the highly organic soil. Aerial roots drop to the water from higher branches.

Scattered on areas of higher elevation throughout the red mangroves and along their perimeter are small concentrations of white mangroves. The white mangrove grows to a height of 30 feet and unlike the red mangrove has no pneumatophores. Rather it is characterized by leathery leaves with two distinct glands located where the petiole attaches at the base of the leaf. These glands allow for the excretion of soils, enabling the plant to tolerate high concentrations of sodium chloride.

The black mangrove is a minor component of the mangrove forest. It grows as a tree in small isolated areas of higher elevation inundated only by very high tides. The black mangrove adapts to salt conditions by excreting sodium through its leaves. It lacks the pneumatophores of the red mangrove and the distinct salt glands of the white mangrove.

Some buttonwood and coastal plain willow have developed with the white mangrove along the mangrove forest perimeters.

In areas of more open water, the dominant plant cover is annual glasswort.

NATURAL ENVIRONMENT SUITABILITY ANALYSIS

Beach and Dunelands

Problems and Opportunities

Beach and duneland areas are extremely fragile natural environments which, when left in their natural state, provide functions of social value. The primary function of coastal dunelands is the buffering of adjacent upland areas from the hazards of coastal storms and hurricanes. During and following storms the beach and dunelands function as sand storage areas and sand suppliers contributing to the protection and stability of the coastline. Beach and dunelands also provide unique wildlife habitats for a variety of wildlife species, many of which are endangered due to loss of habitat in coastal areas to development. Finally, beach and dunelands provide both aesthetic and recreational resources valued by residents and visitors of coastal areas.

The valuable natural functions of beach and duneland areas are dependent upon a stabilized vegetative community which protects the underlying sand from the erosive potential of coastal storms and winds. They are also dependent upon the pioneering capability of the vegetation to reestablish itself on new sand deposited following each storm. Where developed land uses and human activity have removed or disturbed natural vegetation, natural sand stabilization and restorative functions of the beach and dunelands are lost. Shorelines become more susceptible to erosion, wildlife habitat and aesthetic and recreation resources are threatened, and there is increased hazard to residents of adjacent upland areas. In addition there are extremely high hazards associated with all urban development in the beach and duneland area during every major coastal storm event.


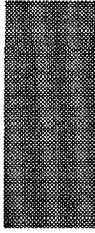
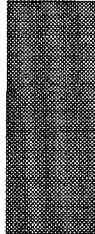


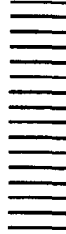

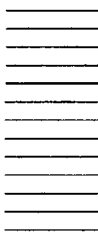

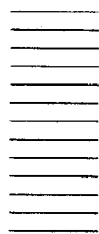
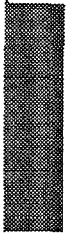

Suitability for Developed Uses

Within the Beach and Dunelands Zone, the landward edge of the primary dune distinguishes those lands which are unsuitable for developed uses of any kind from those which can accommodate developed uses under certain specified conditions (Table VIII-1).

Recognizing the hazards associated with development on the beach and primary dune, these areas should be considered unsuitable for development. No developed uses of any kind should be permitted in these areas. Recreational uses should be managed so as to minimize the disturbance to the primary dune associated with providing public access to the beach.

Implementation of the Coastal Construction Permit Program by the State of Florida supports this conclusion. All construction seaward of the landward limit of the active beach dune system (generally defined as the upland edge of the primary dune) requires a special permit from the Florida State Department of Natural Resources (Chapter 161, Florida Statutes). The limit of the active beach dune is officially designated as the Coastal Construction Control Line. Established State policy with respect to issuance of Coastal Construction Permits is that no new development, aside from shoreline protection structures, should be permitted seaward of the approved Control Line.

TABLE VIII-1
GENERALIZED LAND SUITABILITY FOR DEVELOPMENT

		FLOODING HAZARD		
ENVIRONMENTAL ZONES	SOILS	Coastal High Hazard Areas (V Zones) ¹	100-Year Flood Hazard Areas (A Zones) ¹	Areas Above 100-Year Flood Areas (B & C Zones) ¹
BEACH AND PRIMARY DUNE Beach and Dune Lands	Beach Soils Palm Beach Fine Sand Canaveral Fine Sand			
	Palm Beach Fine Sand Canaveral Fine Sand			
DUNELANDS LANDWARD OF THE PRIMARY DUNE				
UPLAND SCRUBLAND Upland Areas	Canaveral Fine Sand Myakka Fine Sand Lawnwood Sand	NA NA NA		
	Canaveral Fine Sand Myakka Fine Sand Lawnwood Sand	NA NA NA		
MARSH AND MANGROVE FOREST Marsh & Mangrove	Pompano Variant Kaliga Variant	NA NA		
SUITABLE - Soil requires adequate drainage provisions. Site design should utilize existing vegetation to extent practicable.				
MODERATELY - Little limitation or limitations easily corrected by use of normal equipment or design. Soil requires adequate drainage provisions. Site design should limit disturbance to minimum area possible. Good performance and low maintenance can be expected.				
SLIGHTLY - Presence of some limitations which normally can be overcome by careful design and management at somewhat greater costs. Soil requires adequate drainage provisions. Site design should limit disturbance to minimum area possible. Flood hazard mitigation needed.				
UNSUITABLE				

1. See Federal Insurance Administration, Flood Insurance Rate Maps.

TABLE VIII-2
SOIL LIMITATIONS FOR DEVELOPED USES

Soil Name	Shallow Excavations	Dwellings without Basements	Dwellings with Basements	Small Commercial Buildings	Local Roads & Streets	Septic Tank Absorption Fields	Sewage Lagoon Areas
Beach	NA ¹	NA ¹	NA ¹	NA ¹	NA ¹	NA ¹	NA ¹
Palm Beach Fine Sand	Severe: cutbanks cave	Slight	Slight	Slight	Slight	Slight	Severe: seepage
Canaveral Fine Sand	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness	Moderate: wetness	Severe: wetness	Severe: seepage; slope
Myakka Fine Sand	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness	Severe: seepage; wetness
Lawnwood Sand	Severe: cutbanks cave; wetness	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness	Severe: cemented pan; wetness; percs slowly	Severe: seepage; wetness
Pompano Variant	Severe: cutbanks cave; wet- ness; floods	Severe: wetness; floods	Severe: wetness; floods	Severe: wetness; floods	Severe: wetness; floods	Severe: wetness; floods	Severe: wetness; floods; seepage
Kaliga Variant	Severe: too clayey; wetness	Severe: wetness; shrink- swell; low strength	Severe: wetness; shrink- swell; low strength	Severe: wetness; shrink- swell; low strength	Severe: low strength; wetness	Severe: wetness; percs slowly	Severe: seepage; excess humus; wetness

1. No rating available.

Source: U.S.D.A. Soil Conservation Service. Soil Survey of St. Lucie County Area, Florida. March 1980.

Dunelands located landward of the primary dune range from unsuitable to moderately suitable for developed uses (Table VIII-1). Suitability is determined primarily on the basis of flood hazard potential as designated on the St. Lucie County and Fort Pierce Flood Insurance Rate Maps (FIRM's) prepared by the Federal Insurance Administration (FIA). Suitability designations are as follows:

1. Moderately Suitable for Developed Uses¹

Dunelands landward of the primary dune located above the base flood elevation of the 100-year storm (FIRM B and C Zones).

2. Slightly Suitable for Developed Uses²

Dunelands landward of the primary dune located within the area inundated by the 100-year storm (FIRM A Zone).

The slightly suitable designation assumes compliance with FIA floodproofing and stormproofing guidelines.

3. Unsuitable for Developed Uses

Dunelands landward of the primary dune located below the wave crest elevations of the 100-year storm, referred to as the Coastal High Hazard Area (FIRM V Zone).

Duneland areas landward of the primary dune, located above the base flood elevation, are considered only slightly suitable for developed uses. Duneland vegetation is extremely sensitive to impacts during construction; human activity in the vicinity of urban development, once completed, can have serious adverse impacts upon the suitability of the adjacent undeveloped duneland area. Generally land development in all dunelands landward of the primary dune should be discouraged. Where it occurs, it should be designed to reduce the impact area to the minimum extent practicable both during and following construction. Adequate drainage provisions are also required to effectively mitigate the severe limitations for development resulting from the wetness of underlying Canaveral and Palm Beach Soils (Table VIII-2). The use of engineering measures and best management practices are assumed to be a requirement for permitting of all new development.

Upland Areas

Problems and Opportunities

Upland areas on coastal barrier islands are generally the most protected areas, provided some degree of shelter from storms by adjacent beach and duneland areas on their seaward side, and by adjacent marsh and mangrove forest areas on their estuarine side. They are characterized by forest plant species which shade and shelter the ground surface. Plant species tend to be hardy, presenting a sharp visual contrast to island dunelands, marshes and mangroves. The upland forest provides habitats for many species of wildlife.

¹See notes at base of Table VIII-1 (page VIII-11) for a definition of "moderately" and "slightly" suitable.

²Ibid.

While protected from the direct impact of coastal storms, most upland areas on coastal barrier islands, such as Hutchinson Island, are still subject to inundation and associated flood damage during major storms. Poor soil drainage also offers minor limitations for development uses. In addition, because of proximity to sensitive natural beach/duneland and marsh/mangrove forest areas, many activities undertaken in upland forest areas can have adverse effects on the functioning of other natural systems.

Suitability for Developed Uses

Flood hazard potential is the primary determinant of the suitability of upland areas for developed uses (Table VIII-1). Upland areas can be classified as follows:

1. Suitable for Developed Uses

Upland areas located above the base flood elevation of the 100-year storm (FIRM B and C Zones).

2. Moderately Suitable for Developed Uses¹

Upland areas located within the area inundated by the 100-year storm (FIRM A Zone).

The moderately suitable designation assumes compliance with FIA floodproofing and stormproofing guidelines.

No upland areas are located within the Coastal High Hazard Area (FIRM V Zone); consequently none are designated unsuitable for developed uses.

Throughout the upland areas, the soils have severe limitations for development due to wetness (Table VIII-2). While these conditions offer constraints for development, they can be mitigated through the use of engineering measures and best management practices. The suitable and moderately suitable designation for upland areas assumes that such mitigation would occur as a part of all permitted development activity.

Marsh and Mangrove Forest Areas

Problems and Opportunities

Natural functions of the coastal marsh and mangrove forest are essential to the coastal ecosystem. Dense expanses of marsh and mangrove forest adjacent to estuaries mitigate flood hazards from storms by diminishing storm waves and acting as buffers for adjacent uplands. This buffering reduces the erosive potential of storms and contributes to the stabilization of the shoreline.

Circulation of water through marsh and mangrove forest areas cleanses coastal waters, removing silt, toxic chemicals, and excess nutrients. These benefits are particularly important in marshes and mangrove forests adjacent to areas undergoing development where they mitigate adverse water quality impacts of development on the estuarine system.

¹See notes at base of Table VIII-1 (page VIII-11) for a definition of "moderately" suitable.

Marsh and mangrove forest areas provide habitats for a variety of important coastal wildlife species. They are among the most productive habitats, supplying breeding and nursing grounds for many species of fish and shellfish. Coastal mangroves and cordgrasses provide primary productivity that is the basis of the aquatic food chain in the estuary system.

Where marsh and mangrove forest areas are disturbed or filled for development sites, these valuable natural functions are diminished or lost. While marshes and mangrove forests are capable of providing a significant water quality cleansing function, they are highly vulnerable to perturbations in water levels. Filling in marsh and mangrove areas, ditching and draining, interference with tidal movements, and changes to the runoff discharge from upland areas, can adversely affect marshes and mangroves. Frequently these alterations will kill large areas of natural marsh and mangrove vegetation. The result is the loss of natural wetland functions of major social value.

Suitability for Developed Uses

Coastal marsh and mangrove areas are naturally unsuitable for developed uses of any kind (Table VIII-1). This is consistent with established Florida law which identifies areas of marsh and mangrove forest vegetation as surface water resources which should not be degraded by development activity (Chapter 403, Florida Statutes). Filling of marsh and mangroves is permitted by Florida Department of Natural Resources as an exception to this rule where it can be demonstrated that there will be no significant water quality degradation. Such permits are issued on a very limited basis only for filling for a necessary minor component of a much larger development project on adjacent upland areas.

DEVELOPMENT GUIDELINES

Introduction

Protection of the natural environments of the St. Lucie County and Fort Pierce areas of Hutchinson Island requires implementation of a comprehensive set of development guidelines designed to recognize the Island's natural resources requiring protection, natural hazards, and natural limitations for development.

Development guidelines can be implemented for each of the major environmental zones on the Island. The nature of permitted uses, planning and design requirements, and required environmental protection measures during construction can be described separately for the Beach and Duneland Zone, the Upland Area Zone, and the Marsh and Mangrove Forest Zone. In addition specific requirements for surface water management, erosion and sedimentation control, and floodproofing and stormproofing can be implemented for all new development in all areas of the Island regardless of the environmental zone in which it occurs.

The following sections present development guidelines in each of these areas, including:

1. Beach and Duneland Protection.
2. Upland Area Protection.
3. Marsh and Mangrove Forest Protection.
4. Surface Water Management.
5. Erosion and Sedimentation Control.
6. Floodproofing and Stormproofing.

For each, development guidelines are presented within the context of the objectives they are designed to realize, the growth management policies implicit in their use, and the basic administrative actions required at the local level to facilitate their implementation.

Preparation of the development guidelines and associated objectives, policies, and administrative recommendations have been based upon the existing local context of environmental protection. Local plans, policies, ordinances and procedures have been incorporated to the extent possible, as have appropriate State and Federal procedures related to environmental protection.

Beach and Duneland Protection

Beach and Duneland Protection Objectives

Management of land use activities in beach and duneland areas on Hutchinson Island should be directed toward achieving three primary objectives:

- Objective 1: To protect beaches and dunelands from man-induced erosion.
- Objective 2: To preserve coastal dunes as natural hurricane barriers and sources of natural beach replenishment material.
- Objective 3: To preserve beaches and dunelands as valuable recreation and aesthetic resources.

Beach and Duneland Protection Policies

Policies supporting land use and resource management activities consistent with these three objectives include the following:

- Policy 1: Land development practices should be utilized which preserve and protect the natural functions and attractiveness of the beach and duneland system.
- Policy 2: No new construction other than for beach access or shoreline protection should be permitted seaward of the established Coastal Construction Control Line.
- Policy 3: A regional approach to stabilization and restoration of beaches and dunes should be implemented.
- Policy 4: The use of non-structural shoreline protection measures should be utilized in lieu of structural shoreline protection measures.
- Policy 5: Land development practices should be utilized which maintain or improve public access to the beach.
- Policy 6: Beach access should be provided in a manner which provides for the preservation and protection of native dune and beach vegetation.
- Policy 7: Duneland restoration should be required as part of all new development activity.
- Policy 8: Duneland restoration should be encouraged in existing developed areas.
- Policy 9: Coordination should occur among local, State, and Federal authorities having permitting authority for coastal construction activities.

Beach and Duneland Protection Development Guidelines

Coastal Construction Seaward of the Coastal Construction Control Line

1. New Structures

All new construction should be consistent with provisions of established Florida law pertaining to construction seaward of the Coastal Construction Control Line.

Section 161.052, Florida Statutes prohibits any excavation or construction of a dwelling home, motel, apartment building, revetment, or other structure incidental to or related to such structures such as patios, swimming pools, or garages, seaward of the established Coastal Construction Control Line.

Exceptions to the setback requirement are permitted only where:

- a. There is a variance to the established Control Line approved by the Florida Department of Natural Resources made at the request of the property owner.

This variance must be supported by adequate engineering data regarding shoreline stability and storm tide related to shoreline topography demonstrating clear justification for the modification.

- b. Existing structures, which have not been unduly affected by erosion, have established a continuous and uniform construction line seaward of the Control Line.
- c. Structures intended for shore protection purposes have been permitted under the Coastal Construction Permit Program (Florida Statutes, sec. 161.04).
- d. Structures other than those intended for shore protection purposes have been permitted under the Coastal Construction Control Line Permit Program (Florida Statutes, sec. 161.052-.053).

Policies and structural requirements pertaining to the permitting of new construction seaward of the Control Line are established in Section 16-B-33, Florida Administrative Code.

- e. Construction requires only temporary excavation and it can be demonstrated that the ground surface will be returned to approximately its previous elevation and the disturbed area revegetated with suitable vegetation. (Specifically excluded from this exemption is the installation of any outfall lines discharging fluids onto or across the beach and dunes.)

Section 161.052, Florida Statutes further states that any coastal structure erected, or excavation created in violation of the Control Line shall be declared a public nuisance and removed or refilled at the owner's expense.

2. Existing Structures - Modifications, Maintenance and Repairs

Modifications, maintenance and repairs to existing structures should be consistent with provisions of established Florida law pertaining to construction seaward of the established Coastal Construction Control Line.

Section 161.052, Florida Statutes prohibits any modification, maintenance, or repair to any structure located seaward of the Control Line requiring any additions to, or repair or modification of, the existing foundation of that structure. (Specifically excluded from this exemption are seawalls and any additions or enclosures constructed below the first dwelling floor or lowest deck of the existing structure.)

Section 161.102, Florida Statutes further states that any modification, maintenance, or repair to any structure created in violation of the Control Line shall be declared a public nuisance and removed or refilled at the owner's expense.

3. All development activity permitted in accordance with Section 161.052, Florida Statutes should comply with adopted standards and procedures for flood damage prevention.

4. Reconstruction of Existing Structures

Reconstruction of structures located seaward of the Control Line should not be undertaken where coastal storm flooding has destroyed or damaged such structures to an extent greater than fifty (50) percent.

Exceptions should be permitted only in those cases where rebuilding will not:

- a. Render the property subject to further damage through flooding or erosion.
- b. Interfere with the preservation and enhancement of the dune system.
- c. Adversely affect adjacent properties and structures.

5. Shore Protection Measures

Shoreline protection measures should be undertaken in conformance with established Florida law.

Section 161.041-.042, Florida Statutes requires a Coastal Construction Permit from the Florida Department of Natural Resources for any construction or physical activity undertaken specifically for shore protection purposes, or other structures and physical activity including groins, jetties, moles, breakwaters, seawalls, revetments, artificial nourishment, inlet sediment bypassing, excavation or maintenance dredging or inlet channels, or other deposition or removal of beach material.

Such permits must be obtained for all such actions to be performed upon state sovereignty lands, which are taken to mean lands below the mean high waterline of any tidal water of the state.

Policies and structural requirements pertaining to the permitting of shoreline protection measures are established in Section 16-B-33, Florida Administrative Code.

6. Walkover Structures

Beach walkover structures should be limited in density where possible, while providing sufficient access for all beach users.

Walkways should be designed so as to minimize short-term disturbance to the dune system and to existing vegetation, and to allow for the growth of new vegetation.

Construction of walkover structures shall require a permit from the Department of Natural Resources under the Coastal Construction Control Line Permit Program (Florida Statutes, sec. 161-052-.053).

The following guidelines are to be utilized in the design of walkover structures:

a. General Design

Walkways to be constructed across vegetated dunes or dune ridges or across heavily vegetated beach berms should be pile supported and elevated above the vegetation in order to allow for continued growth beneath the walkway deck. In general, the minimum deck elevation should be approximately three feet above grade. The number of walkways on a site and the width of each walk should depend on the expected volume and type of traffic. Typical private walkways, not designed for handicapped access, should be no wider than four feet.

b. Support Design

Support piles should not be placed on seaward dune or dune ridge slopes steeper than approximately 1:1 or 45°. Whenever possible, stairways from the top or crest of a dune ridge down to the beach should be designed to completely span the seaward slope of the dune. Pile tips should not be encased in concrete. Piles should be installed with a typical penetration of six to eight feet below grade. In addition, piles should be spaced a sufficient distance to promote the propagation of stabilizing dune vegetation.

c. Location

Walkways should generally be constructed on a shore-normal alignment where crossing dunes or dune ridges. Special ramps may, however, be aligned so as to permit access for handicapped individuals, and stairs. Stairs from existing bulkheads should be placed parallel to the walls. Walkways should

generally not extend further than approximately 10 feet seaward of the toe of any dune or dune ridge slope. Support piles for simple walkways should not be placed within five feet of the crest of a dune or the top of a bluff or steep escarpment. Observation platforms, viewing decks, boardwalks or gazebos should be located at least 15 feet landward from the crest of a dune ridge in order to assure the stability of steep dune slopes.

d. Conditions

Design specifications should require immediate restoration of dune topography or vegetation which must be unavoidably damaged or disturbed.

No excavation associated with walkway construction should be performed except for that incidental to the placement of support piles.

7. Construction Disturbance Associated with Development of Adjacent Uplands

Section 161.052, Florida Statutes requires a Coastal Construction Control Line Permit from the Florida Department of Natural Resources for any disturbance to land seaward of the Coastal Construction Control Line caused by the development of adjacent upland areas.

Coastal Construction on Dunelands Landward of the Coastal Construction Control Line

1. Minimization of Impact Area

Development activity affecting areas characterized by duneland plant species should be reduced to the minimum possible. Where conditions permit, structures should be located landward of the active beach-dune system.

2. Areas Characterized by Endangered and Threatened Species

Vegetation identified as endangered and threatened (Section 581.185, Florida Statutes) or as of public value due to shoreline stabilization capabilities (Section 370.41, Florida Statutes) should be protected during all phases of development.

3. Minimization of Impact during Construction

Construction disturbance of dunelands located upland of the Control Line should be kept to the minimum possible.

Prior to the commencement of construction, duneland areas not within the immediate area required for construction should be enclosed with sand fencing. No vehicular or pedestrian traffic

should be permitted within the fenced area for the duration of the construction period.

4. Restoration of Areas Disturbed during Construction

Dunelands disturbed during construction should be immediately restored to stable condition. Restoration techniques should be designed to achieve the maximum stability possible. Techniques should include, but not be limited to, sand replenishment, placement of sand fences, and revegetation utilizing native dune species. Professional guidance in plant selection and design of supplementary control measures should be utilized. Accepted guidelines of the State Department of Natural Resources should be used in all restoration activities.

5. General Duneland Restoration

All duneland areas included within a parcel undergoing development should be restored to stable condition as part of the site development plan. Such restoration should be undertaken regardless of whether the damage is associated with the construction activity or occurred prior to site development.

Native plants suited to local soil and climate should be used for duneland restoration.

Invasive species such as Australian Pine (*Casuarina* spp.), Brazilian Pepper (*Schinus terebinthifolius*), *Melaleuca* (*Quinquenervia*), and Cajuput Tree (*Melaleuca* spp.) should not be planted.

Selective removal of invasive plant specimens should be undertaken as part of the overall dune restoration program.

6. Walkover Structures

Walkover structures should be provided in new developments where pedestrian traffic is anticipated between the development and the beach.

General standards for design of walkover structures are presented above under Coastal Construction Seaward of the Coastal Construction Control Line (5).

7. Wildlife Impacts

New development should minimize any interference with the natural use of the beach for feeding, foraging, resting, nesting and breeding by indigenous and migratory birds, shellfish, marine fishes, sea turtles and other wildlife. Such interference includes the destruction or diminution of organisms or material upon which wildlife feed.

Beachfront lighting should be designed so as to minimize potentially adverse impacts upon behavioral patterns of nesting or hatching sea turtles.

8. Areas of Potential Breach Hazard

Development should not be located in areas of potential breach hazard.

Areas of potential breach hazard should generally be defined as those where areas characterized by duneland vegetation are located adjacent to areas characterized by marsh or mangrove forest vegetation.

9. Guidelines for Permitted Activity in Beach and Dunelands Areas

All permitted development activity in beach and duneland areas should comply with all guidelines for Upland Areas. (See Upland Area Protection below.)

Beach and Duneland Protection Administrative Guidelines

Coastal Construction Control Line

Recommended Action 1

State laws pertaining to coastal construction seaward of the Coastal Construction Control Line should be strictly interpreted and enforced during the review of new development proposals.

Recommended Action 2

State regulations pertaining to coastal construction should be periodically reviewed and evaluated so as to remain responsive to changing state policies and regulations.

Recommended Action 3

A vegetation survey should be undertaken to determine the extent to which plant cover typical of the primary dune is included within the area protected by the Coastal Construction Control Line setback provisions. (To be performed in conjunction with Dune Restoration, Recommended Action 1.) Where primary dune plant species are located landward of the Control Line consideration should be given to establishing a setback requirement landward of the Control Line. The amended line should be located along the landward extent of the active beach-dune system.

Shoreline Protection and Beach Restoration

Recommended Action 1

A study of beach zone conditions should be undertaken to determine areas in need of shoreline protection and/or beach restoration. Adjacent coastal jurisdictions should be encouraged to

participate to provide a regional approach to problem definition and solution.

Results of this study should provide a basis for identifying beach restoration needs and for preparing a coordinated plan for shoreline protection and stabilization.

Recommended Action 2

Beachfront property owners should be encouraged to restore beachfront properties in accordance with the overall beach restoration plan.

Dune Restoration

Recommended Action 1

A vegetation survey should be undertaken to locate and describe all areas of duneland vegetation (to be performed in conjunction with Coastal Construction Control Line, Recommended Action 3). This should address all duneland areas, including those adjacent to or included within existing developed areas as well as within undeveloped areas.

Particular attention should be given to recording the condition of dune areas.

Sites in need of restoration should be prioritized.

Management strategies should be developed for areas in need of restoration.

Implementation strategies should be developed to determine available alternative funding mechanisms from both the public and private sector.

Recommended Action 2

Guidelines should be prepared for dune restoration. These should focus upon the selection, planting and maintenance of native plants suited to local soil and climate conditions.

Recommended Action 3

Local development of nursery stock suitable for dune restoration as specified in the dune restoration guidelines should be encouraged.

Recommended Action 4

Owners of developed areas characterized by duneland vegetation should be encouraged to restore areas in conformance with duneland management strategies.

Duneland restoration in accordance with the duneland management strategies should be required as part of all development activities on sites characterized by duneland plant species.

Beach and Duneland Use

Recommended Action 1

State and local prohibitions on the use of vehicles in beach and duneland areas should be strictly enforced.

Recommended Action 2

State and local prohibitions on the disturbance of protected beach and duneland plant species should be strictly enforced.

Site Plan Review

Recommended Action 1

An assessment of the impact of proposed development upon beach and duneland resources should be required as part of all requests for site plan and subdivision approval.

Preparation of a site vegetation survey should be required as part of this assessment.

Recommended Action 2

A list of local native duneland plant indicators should be prepared. This list should be utilized during review of vegetation surveys for proposed development sites to identify areas of potential adverse effects upon the beach and duneland system.

Beach and Duneland Acquisition

Recommended Action 1

Available State and Federal sources for funds to acquire undeveloped beach and duneland properties should continue to be investigated. These efforts should be directed toward those properties for which the owners have no current approved development plan.

Walkover Design

Recommended Action 1

Specifications should be prepared for beach and dune walkover structures. These should reflect existing guidelines currently in use by the Florida Department of Natural Resources.

Areas of Potential Breach Hazard

Recommended Action 1

Areas of potential breach hazard should be identified. Technical assistance for this analysis should be sought from experts at the University of Florida or other appropriate scientific or engineering authority.

Lacking a detailed geologic survey to identify potential breach zones, potential hazard areas can be preliminarily identified as those areas of narrowing on Hutchinson Island where duneland areas are located immediately adjacent to areas of marsh or mangrove forest.

Upland Area Protection

Upland Area Protection Objectives

Management of land use activities in upland areas on Hutchinson Island should be designed to achieve five primary objectives:

- Objective 1: To promote land development in upland areas which is sensitive to the natural characteristics of the environment.
- Objective 2: To prevent adverse impacts on beach/duneland and marsh/mangrove forest areas during development of adjacent upland areas.
- Objective 3: To maximize areas of open space in upland areas.
- Objective 4: To promote the preservation and enhancement of native vegetation.
- Objective 5: To protect against hazards of coastal storm flooding.

Upland Area Protection Policies

Policies supporting land use and resource management activities consistent with these five objectives include the following:

- Policy 1: Site design in upland areas should be encouraged which is responsive to existing topographic, drainage and vegetation conditions.
- Policy 2: The extensive placement of fill in upland areas should be discouraged where it will result in extensive damage to natural vegetation.
- Policy 3: Surface water management measures should be designed to minimize, to the greatest extent practicable, changes in the quantity, quality, rate and temporal characteristics of stormwater discharge.
- Policy 4: Development and land use activities in upland areas should be conducted in a manner which will minimize soil erosion.
- Policy 5: Development in upland areas should be encouraged to preserve as much natural vegetation as possible. The use of native plant species should be encouraged in replanting. Selective removal of invasive plant species should be recommended.
- Policy 6: Site design in upland areas should be encouraged in which allowable densities are obtained with the least practicable impervious cover and loss of open space.

Policy 7: Development activity which will contribute to the degradation of adjacent sensitive areas, including beach/dunelands and marsh/mangrove forest areas, should not be permitted in upland areas.

Policy 8: Development activity in upland areas should be required to provide protection from floods having a 100-year recurrence interval.

Upland Area Protection Development Guidelines

Site Design

1. Site design should be responsive to natural topographic, drainage and vegetation conditions. It should reflect attempts to:
 - a. Reduce filling requirements to the minimum practicable.
 - b. Preserve areas of mature upland vegetation.
 - c. Utilize on-site water recharge capabilities.

Relation to Adjacent Sensitive Areas

1. Development in upland areas should not adversely impact adjacent sensitive areas, including duneland/beach and marsh/mangrove areas.
2. Upland development activities should not result in the degradation of surface water draining into sensitive areas either during or after construction.
3. To the extent practicable, developed portions of upland sites should be setback fifty (50) feet from the limit of adjacent marsh/mangrove areas. Within this area native upland vegetation should be retained.
4. Upland development design should promote efficient beach access patterns which will minimize dune disturbance. Pedestrian and vehicle circulation patterns should promote minimum traffic over undeveloped duneland areas adjacent to the upland development site.

Impervious Surfaces

1. Site design in upland areas should minimize impervious surface areas and maximize retention of open space, particularly of areas of mature upland vegetation.

Minimum Elevations

1. Residential and Non-Residential Structures

Minimum elevations for residential and non-residential structures, permitted under Guideline 3 above, should be in accordance with adopted procedures for flood damage prevention.

2. Roads and Driveways

Minimum elevation of road crown should be 5.0 feet based on National Geodetic Vertical Datum (NGVD).

Crown elevations less than 5.0 NGVD should be considered where unique design solutions take advantage of existing vegetation and topography while providing for adequate drainage and safe removal of storm waters.

Filling Procedures

1. Where practicable material required to establish minimum building elevations should be obtained off-site.
2. All material used to establish minimum building elevation should be clean, free of contaminants, and suitable for foundation placement.

Erosion and Sedimentation Control

1. An erosion and sedimentation control plan should be required as part of an application for site plan review whenever a development will involve any clearing, grading, transporting, or other land disturbance associated with earth movement. (See Erosion and Sedimentation Control below.)

Surface Water Management

1. In order to ensure adequate drainage, protection of water quality, and flood protection, an approved surface water management plan should be required as part of all applications for subdivision or site plan review. (See Surface Water Management below.)

Such surface water management plan should provide for the gradual and dispersed drainage of surface runoff so that runoff from within the boundaries of the proposed development will approximate natural rates, volumes, and direction of flow from that parcel.

Floodproofing and Stormproofing

1. All development activity should be in accordance with adopted standards for flood damage prevention. (See Floodproofing and Stormproofing below.)

Wastewater Facilities

1. No septic tank outlet or drainfield should be installed below a finished grade equal to the flood elevation associated with a storm of 20-year recurrence interval.

In areas located above the flood level of the 20-year storm, the minimum elevation for a septic tank outlet or drainfield should be seven (7) feet above mean sea level.

2. Septic tanks or drainfields should not be permitted unless it can be demonstrated that the design and location of the proposed disposal system ensures that there will be no seepage or release of impure or polluted water beyond the boundaries of the development parcel.
3. No septic tank or drainfield should be permitted within fifty (50) feet of the limit of adjacent marsh and mangrove forest areas.

Clearing and Revegetation

1. All trees greater than six (6) inches (dbh) in diameter should be considered mature upland tree specimens, provided that such specimens are healthy and can be expected to remain so for a reasonable period of time. These specimens should be preserved to the extent practicable during development.
2. All trees greater than twenty-four (24) inches (dbh) in diameter should be considered unique upland tree specimens, provided that such specimens are healthy and can be expected to remain so for a reasonable period of time. These specimens should be preserved and protected.
3. Vegetation identified as endangered and threatened (Section 581.185, Florida Statutes) should be protected during all phases of development.
4. Landscaping shall be in conformance with established landscaping and screening regulations (St. Lucie County Ordinance No. 76-3; Fort Pierce Zoning Ordinance, Section 30-59).

Species selected to meet planting requirements should, to the extent possible, be native trees and shrubs in those combinations which may be expected to be found together naturally on sites comparable to those where the trees and shrubs are to be planted.

5. Invasive species such as Australian Pine (*Casuarina spp.*), Brazilian Pepper (*Schinus terebinthifolius*), Melaleuca (*Quinquenerivida*), and Cajepit Tree (*Melaleuca spp.*) should not be planted.
6. Selected removal of invasive plant specimens should be undertaken where such action will not prove disruptive.

Protection of Natural Vegetation During Construction

1. Protection of vegetation from mechanical injury should include:

- a. All woody vegetation to be retained within 25 feet of a building site, parking area or other proposed improvement should be protected from equipment damage by fencing or other effective barriers.
- b. Heavy equipment operators should not damage existing tree trunks and roots. Feeder roots should not be cut closer than 25 feet from tree trunks, wherever practicable.
- c. Tree trunks, exposed roots, and tree limbs damaged during construction, should be protected from further damage and immediately attended to by removing the damaged sections and applying tree wound dressing. Damaged trees should be irrigated if necessary.
- d. The operation of heavy equipment over root systems of all woody vegetation should be minimized to prevent soil compaction.
- e. Trees should not be used for roping, cables, signs or fencing. Nails and spikes should not be driven into trees.
- f. The area around the base of existing woody vegetation should be left open. No impervious cover, storage or equipment, materials, debris or fill, should be allowed within the drip line of any existing tree.

2. Protection of vegetation from grade changes and excavations should include:

- a. Grade changes to occur on the property should be restricted in areas immediately adjacent to existing vegetation to be retained following site disturbance, unless adequate provisions are made to protect such vegetation and its root systems from the adverse effects of changes to soil and drainage conditions.
- b. Grade changes to occur at any location on the applicant's property should not result in an alteration to drainage conditions which would adversely affect existing vegetation to be retained following site disturbance.
- c. When digging trenches for utility lines or similar uses, the applicant should bypass the root zones of all woody vegetation, wherever practicable.
- d. If trenches must be excavated in the root zone, all major disturbed roots should be cut as cleanly as possible and painted with tree wound dressing. The trench should be backfilled as quickly as possible, avoiding soil compaction.

Wildlife Habitat

1. Upland development should not interfere with habitats of those species designated as rare and endangered (Section 581.185, Florida Statutes).
2. Preservation of upland vegetation should attempt to maximize opportunities for the use of those areas by native wildlife species.

Upland Area Protection Administrative Guidelines

Site Plan Review

Recommended Action 1

An assessment of the impact of proposed development upon upland hammock forest areas should be required as part of all requests for site plan approvals. Preparation of a site vegetation survey should be required as part of this assessment.

Coordination with Florida State Permitting Authorities

Recommended Action 1

Coordination among State and local permitting authorities and the property owner or developer should be undertaken as early as possible in the site planning process.

The purpose of such coordination should be:

- a. To provide a comprehensive and efficient evaluation of potential project impacts at an early stage in the planning process.
- b. To formulate a coordinated and consistent response to development proposals.
- c. To avoid undue costs to the property owner or developer resulting from delays, successive requests for modifications to the project design, or requests for changes to the project design after major portions of the project design have been completed.

Environmental Impact Assessment Procedure

Recommended Action 1

An environmental impact assessment procedure should be developed and implemented. This procedure should mandate consideration of all effects upon the natural environment likely to occur as a result of all new development activity.

This procedure should require all applicants to document existing conditions of a proposed development site and to accurately assess impacts of the project upon it. Particular attention should be directed toward the description and location of existing vegetative cover on the site.

Native Plant Species

Recommended Action 1

A list of native plant species recommended to meet landscaping requirements should be prepared for the natural environments of the St. Lucie County and Fort Pierce areas of Hutchinson Island.

Marsh and Mangrove Forest Protection

Marsh and Mangrove Forest Protection Objectives

Management of land use activities in marsh and mangrove forest areas on Hutchinson Island should be designed to achieve four primary objectives:

- Objective 1: To preserve the natural functions of marsh and mangrove forest areas related to water quality protection.
- Objective 2: To preserve marsh and mangrove forest areas as valuable wildlife habitats.
- Objective 3: To preserve the natural functions of marsh and mangrove forest areas related to flood hazard mitigation.
- Objective 4: To preserve marsh and mangrove forest areas as valuable recreation and aesthetic resources.

Marsh and Mangrove Forest Protection Policies

Policies supporting land use and resource management activities consistent with these four objectives include the following:

- Policy 1: Land development practices should be utilized which preserve and protect the natural functions and attractiveness of marsh and mangrove forest areas.
- Policy 2: Modification of marsh and mangrove forest areas should be permitted only when it can be demonstrated that there will be no significant degradation of surface water resources, loss of valuable wildlife habitat, or increased flood hazard damage.
- Policy 3: Coordination should occur among local, State and Federal authorities having permitting authority for development activity potentially affecting marsh and mangrove forest areas.
- Policy 4: Public works activities such as transportation projects, mosquito control and drainage activities should avoid any identified adverse impacts upon marsh and mangrove forest areas.

Marsh and Mangrove Forest Protection Development Guidelines

Development Activity in Marsh and Mangrove Forest Areas

1. Marsh and Mangrove Forest Protection

Development activity (unless specifically exempted by Section 17-4.04, Florida Administrative Code) should not be permitted

in areas dominated by naturally-occurring marsh and mangrove forest plant species where such activity will result in the pollution or degradation of surface water resources, the loss of valuable wildlife habitat, or increased hazard of flood damage.

2. Marsh and Mangrove Forest Plant Species Defined

Areas of marsh and mangrove forest plant species should be defined as:

- a. Those dominated by the presence of one or a combination of the following species:

Batis	<i>Batis maritima</i>
Big Cordgrass	<i>Spartina cynosuroides</i>
Black Mangrove	<i>Avicennia germinans</i>
Black Rush	<i>Juncus roemerianus</i>
Cuban Shoalweed	<i>Diplanthera (Halodule) wrightii</i>
Leather Fern	<i>Acrostichum aureum</i>
Manatee Grass	<i>Syringodium filiformis</i>
Red Mangrove	<i>Rhizophora mangle</i>
Rubber Vine	<i>Rhabdadenia biflora</i>
Smooth Cordgrass	<i>Spartina alterniflora</i>
Turtle Grass	<i>Thalassia testudinum</i>
Widgeon Grass	<i>Ruppia maritima</i>
White Mangrove	<i>Laguncularia racemosa</i>

- b. That portion of a surface water body up to the waterward first fifty (50) feet or the waterward quarter (1/4) of the entire area, whichever is greater, where one or a combination of the following are the dominant species:

Aster	<i>Aster tenuifolius</i>
Beach Carpet	<i>Philoxerus vermicularis</i>
Button Wood	<i>Conocarpus erecta</i>
Glasswort Annual	<i>Salicornia bigelovii</i>
Glasswort Perennial	<i>Salicornia virginica</i>
Key Grass	<i>Monanthochloe littoralis</i>
Salt Grass	<i>Distichlis spicata</i>
Sea Blite	<i>Suaeda linearis</i>
Sea Daisy	<i>Borrchia frutescens</i>
	<i>Borrchia arborescens</i>
Sea Grape	<i>Coccoloba uvifera</i>
Sea Lavender	<i>Limonium carolinianum</i>
Sea Purslane	<i>Sesuvium portulacastrum</i>
Switch Grass	<i>Spartina patens</i>
Railroad Vine	<i>Ipomoea pes-caprae</i>

3. Permitted Activity in Marsh and Mangrove Forest Areas

Permits as required by Chapters 161, 253, 258 and 403, Florida Statutes, and Title 33, Section 209.320, Code of Federal Regulations are required as a guarantee that development

activity in marsh and mangrove forest areas will not result in the pollution or degradation of surface water resources, the loss of valuable wildlife habitat, or increased hazard of flood damage.

4. Compliance with Permit Conditions

All development activity undertaken in marsh and mangrove swamp areas by permits from State and Federal authorities should be conducted so as to guarantee satisfaction of all conditions specific to the permits allowing such activity.

5. Exemption Provision

Where it can be demonstrated that an area dominated by marsh and mangrove forest plant indicators is the direct result of mosquito control activities undertaken as part of a governmental mosquito control program, development on such areas should be exempted from permitting requirements pursuant to Chapter 403, Florida Statutes.

A determination as to whether an area comes under this provision should be made on a site-by-site basis and in coordination with the State and local permitting authorities. Documentation to be provided by the developer to support site-specific determinations should include:

- a. Historical aerial photographs, when available.
- b. Records of governmental mosquito control activities on or directly affecting the site.
- c. Substrate and cover type surveys of the site.
- d. Topographic survey of the site.
- e. Comparison of site conditions to those of confirmed natural marsh or mangrove forest areas at similar elevations in the proposed project's vicinity.

6. Guidelines for Permitted Activity in Marsh and Mangrove Forest Areas

All permitted development activity in marsh and mangrove forest areas should comply with all guidelines for Upland Areas. (See Upland Area Protection below.)

7. Areas of Potential Breach Hazard

Development should not be located in areas of potential breach hazard.

Areas of potential breach hazard should generally be defined

as those where areas characterized by duneland vegetation are located adjacent to areas characterized by marsh or mangrove forest vegetation.

Marsh and Mangrove Forest Administrative Guidelines

General Marsh and Mangrove Forest Resource Protection

Recommended Action 1

State and Federal law pertaining to the protection of areas dominated by marsh and mangrove forest plant species should be strictly interpreted and enforced during the review of new development proposals.

Recommended Action 2

State and Federal regulations pertaining to development in marsh and mangrove forest areas should be periodically reviewed and evaluated so as to remain responsive to changing State policies and regulations.

Recommended Action 3

A vegetation and substrate survey should be undertaken to accurately locate all areas dominated by marsh and mangrove forest plant species considered indicators of the landward extent of waters of the State (see Section 17-4.01(17), Florida Administrative Code).

Substrate conditions should be evaluated so as to permit an indication of those marsh and mangrove forest areas which are the result of naturally-occurring hydrologic conditions, from those which are the result of vegetation changes due to governmental mosquito control programs.

The ecological condition of all marsh and mangrove forest areas should be evaluated and recorded so as to provide an assessment of the relative value of those areas as wildlife surface water, flood hazard mitigation, and aesthetic resources.

Site Plan Review

Recommended Action 1

An assessment of the impact of proposed development upon marsh and mangrove forest areas should be required as part of all requests for site plan approvals. Preparation of a site vegetation survey should be required as part of this assessment.

Recommended Action 2

Review criteria should be developed in coordination with the State Department of Natural Resources for determining whether a marsh and mangrove forest area is subject to permitting requirements pursuant to Chapter 403, Florida Statutes.

Coordination with Florida State Permitting Authorities

Recommended Action 1

Coordination among State and local permitting authorities and the property owner or developer should be undertaken as early as possible in the site planning process.

The purpose of such coordination should be:

- a. To provide a comprehensive and efficient evaluation of potential project impacts at an early stage in the planning process.
- b. To formulate a coordinated and consistent response to development proposals.
- c. To avoid undue costs to the property owner or developer resulting from delays, successive requests for modifications to the project design, or requests for changes to the project design after major portions of the project design have been completed.

Recommended Action 2

Proposed developments for which the State is likely to approve permits to fill marsh and mangrove forest areas should be reviewed to determine any specific impact mitigation measures which should be considered by the State as a condition of permit approval.

Conditions should address, on an individual site basis, the following general areas:

- a. The acceptable limits of filling given the size and ecological condition of the marsh and mangrove forest area.
- b. The acceptable limits of construction disturbance.
- c. Desirable erosion control measures.
- d. Desirable revegetation measures.
- e. Impact monitoring provisions.

Recommended Action 3

Local policy should be developed regarding the deeding to public ownership of undeveloped marsh and mangrove forest areas for which the development rights have been utilized through density transfer.

Such policy should consider issues related to:

- a. Responsibility for legal boundary descriptions of the parcel to be conveyed.
- b. Public access to the parcel.
- c. Resource management.
- d. Maintenance requirements.

Recommended Action 4

Support should be given to the monitoring of site development activities to guarantee that conditions of State permit approvals are implemented.

Areas of Potential Breach Hazard

Recommended Action 1

(See Beach and Duneland Protection - Administrative Guidelines (Areas of Potential Breach Hazard).)

Surface Water Management

Surface Water Management Objectives

Surface water management on Hutchinson Island should be designed to achieve six primary objectives:

- Objective 1: To protect the natural, physical, chemical, and biological quality of surface water resources.
- Objective 2: To maintain the aesthetic quality and recreational amenity of surface water resources.
- Objective 3: To reduce flooding hazards.
- Objective 4: To promote best management stormwater management measures.
- Objective 5: To promote groundwater recharge.
- Objective 6: To minimize health hazards.

Surface Water Management Policies

Policies supporting land use and resource management activities consistent with these six objectives include the following:

- Policy 1: Surface water management measures should be designed to minimize, to the greatest extent practicable, changes in the quantity, quality, rate and temporal characteristics of stormwater discharge.
- Policy 2: All storm drainage improvements should be designed to maximize the use of natural surface drainage channels.
- Policy 3: Water control methods should be provided within development plans to drain the project either to adequate retention areas and/or outlets that can be legally maintained in permanent use or into a public drainage system of sufficient capacity to efficiently drain projected runoff from the project resulting from the 3-year storm.
- Policy 4: Surface drainage schemes for new developments should provide for retention or detention of excess runoff if the "receiving" drainage corridors (natural or man-made) are flowing at capacity.
- Policy 5: Stormwater disposal by percolation/storage methods should be permitted only if site size and soil conditions permit a design of percolation/storage facilities that will preclude ponding water on paved areas during a 3-year storm.

Policy 6: Storm drainage improvements should be designed to retain excess surface runoff in natural groundwater recharge areas.

Surface Water Management Development Guidelines

Surface Water Management - General Requirements

1. Surface Water Management Plans - General

In order to ensure adequate drainage, protection of water quality, and flood protection, an approved surface water management plan shall be required as part of all applications for subdivision or site plan review.

2. Surface Water Management Plans - Projects of Two (2) Acres or More of Impervious Surface

Surface water management plans for projects with two or more acres of impervious surface shall comply with current criteria of the South Florida Water Management District or applicable local criteria, whichever are more restrictive.

3. Surface Water Management Plans - Projects of Less than Two (2) Acres of Impervious Surface

Surface water management plans for projects with less than two acres of impervious surface shall be reviewed by the Engineer, unless such construction is determined to be minor and the surface water management plan requirement is waived.

4. Surface Water Management Plans - General Guidelines

Surface water management plans should be designed to comply with the following general guidelines:

- a. Surface drainage systems should be designed for at least a three-year rainfall.
- b. Individual project drainage provisions should be related to adjacent developments so as to reduce cumulative adverse effects.
- c. Engineering techniques should be utilized which minimize impacts of surface runoff to receiving waters and, if possible, aid in purification of runoff before it is discharged into receiving waters.
- d. Use of drainage systems which place outfalls at a single location should be avoided. Street drainage patterns should be achieved before actual discharge into receiving waters.

- e. Retention areas should be utilized before final discharge.
- f. Extensive paved surfaces, especially those for parking lots, adjacent to the water's edge should be avoided.
- g. Soil and vegetation should be used to aid in infiltration before discharge into coastal waters.
- h. Runoff from streets and yards should be carefully controlled to prevent flooding in adjacent areas or pollution of water bodies. Catchment basins should be constructed at storm sewer outfalls to prevent silt and other pollutants from entering water areas.
- i. There should be no direct discharge of surface runoff into estuarine waters. Runoff should be filtered through on-site retention basins designed to accommodate a three-year rainfall.

Surface Water Management Administrative Guidelines

Coordination with Florida State Permitting Authorities

Recommended Action 1

Coordination among State and local permitting authorities, and the property owner or developer should be undertaken as early as possible in the site planning process.

The purpose of such coordination should be:

- a. To provide a comprehensive and efficient evaluation of potential project impacts at an early stage in the planning process.
- b. To formulate a coordinated and consistent response to development proposals.
- c. To avoid undue costs to the property owner or developer resulting from delays, successive requests for modifications to the project design, or requests for changes to the project design after major portions of the project design have been completed.

Local Surface Water Management Criteria

Recommended Action 1

Additional local performance standards for surface water management should be established as appropriate to control water runoff, enhance water quality, enhance groundwater recharge, and minimize erosion.

Recommended Action 2

A local ordinance or procedural manual defining criteria for drainage plan review should be adopted.

Erosion and Sedimentation Control

Erosion and Sedimentation Control Objectives

A comprehensive erosion and sedimentation control program should be designed to achieve four primary objectives:

- Objective 1: To maintain existing water quality.
- Objective 2: To reduce flood hazard and damages.
- Objective 3: To minimize costs associated with erosion and sedimentation.
- Objective 4: To maintain the aesthetic quality of the environment.

Erosion and Sedimentation Control Policies

Two primary policies support land use and resource management activities consistent with these objectives:

- Policy 1: Development and land use activities should be conducted in a manner which will minimize soil and beach erosion.
- Policy 2: All development activity should be conducted in accordance with an approved erosion and sedimentation control plan.

Erosion and Sedimentation Control Development Guidelines

Erosion and Sedimentation Control - General Requirements

1. An Erosion and Sedimentation Control Plan

An erosion and sedimentation control plan should be required as part of an application for site plan review whenever a development will involve any clearing, grading, transporting, or other land disturbance associated with earth movement.

2. Site Plan Design

The site plan for proposed development should be fitted to the natural conditions of the site to create the least erosion potential.

3. Soil Loss

Soil loss from the construction site should be kept as close as possible to that typical of the site in its undisturbed condition.

Sediment should be retained on-site. Sediment basins, debris basins, desilting basins and silt traps should be installed and maintained to remove sediment from runoff water.

4. Surface Water Resources Protection

An effective means of turbidity control should be employed during all operations that may create water quality conditions on- or off-site which are in violation of water quality standards set forth in Chapter 17-3, Florida Administrative Code.

5. Structural Erosion Control Measures

Structural erosion control measures should be designed and installed in accordance with accepted standards.

6. Non-Structural Erosion Control Measures

Seeding, mulching and sodding of critical areas should be performed in accordance with accepted standards.

Erosion and Sedimentation Control - During Construction

1. Stabilization of Disturbed Areas

Permanent vegetation, sodding, and erosion control structures should be installed within fourteen (14) days after final grading, dredging, or filling operations have been completed.

2. Protection of Revegetated Areas

Newly seeded or vegetated areas damaged by construction activities should be immediately reseeded, mulched, or sodded.

3. Runoff Damage

During construction, adequate protective measures should be provided to minimize damage from runoff to the cut face of excavations or the sloping surface of fills.

4. Disposal of Intercepted Runoff

Any discharges during construction should be conveyed through the stormwater management system.

Handling of all stormwater should be conducted in conformance with an approved surface water management plan (see Surface Water Management above.)

Outlets for all intercepted and channelized flow should be stabilized and located where infiltration will occur naturally.

5. Pumping Water

Water being pumped on construction sites should be discharged onto a stabilized area. Pumped water should not be discharged onto fill slopes, spoil piles, or other highly erodible areas.

6. Buffer Strips

A protective area of vegetated cover should be left or established between the construction site and adjacent surface water resources, including marsh and mangrove forest areas.

7. Stockpiling Soil and Fill Material

Excavated soil and fill should not be placed adjacent to surface water resource areas, including marsh and mangrove areas, in a manner which will cause material to degrade those resources during construction.

All stockpiled soil should be stored in a stabilized condition.

8. Activity in Surface Water Resource Areas

Construction operations permitted in surface water resource areas, including marsh and mangrove forest areas, should be restricted to those areas which must be entered for construction of temporary or permanent structures.

Surface water resource areas should be promptly cleared of all temporary false work, piling, debris, or other obstruction immediately after construction is completed.

9. Erosion Control at Borrow Sites

Borrow sites should be selected with full consideration of erosion control. Such operations should not be located in surface water resource areas. Before borrow operations are begun, a plan for the control of drainage water should include measures to prevent sediment from entering streams.

Construction Scheduling

1. Clearing Staging

Construction schedules should be organized such that only those portions of the site to be developed within thirty (30) days are cleared at any one time. This applies to all sites except those for which the costs of mobilizing earthmoving equipment prohibit the staging of clearing operations to conform with construction activity. For those exceptions, all the required site area may be cleared provided that protective vegetative cover or mulch is installed within fourteen (14) days on portions of the site not to be developed or required for staging within thirty (30) days.

2. Suggested Construction Scheduling

Scheduling of construction operations should conform to the following:

- a. Site preparation including clearing and grading should be scheduled for periods of low precipitation to minimize erosion potential and to allow for the establishment of protective vegetative cover.
- b. Diversions, sediment basins, and similar required structures should be installed prior to any on-site clearing and grading.
- c. Vegetative buffers should be established on slopes, stream banks, and surface drainage areas prior to on-site clearing and grading.
- d. Clearing, grading and stabilization of one area should be accomplished before clearing and grading begins in another.
- e. Drainage systems should be constructed as soon as possible.

Monitoring

1. Violation of Water Quality Standards

If monitoring reveals violations of State Water Quality Standards (Chapter 17-3, Florida Administrative Code), additional monitoring may be required and/or modifications to project design shall be required to alleviate water quality violations.

Maintenance Provisions

1. During and Immediately Following Construction

All necessary soil erosion and sedimentation control measures should be adequately maintained by the developer during the construction period and for one year after completion of the approved plan or until such measures are permanently stabilized.

2. Following Stabilization

A responsible party should be designated to perform necessary maintenance operations on all erosion and sedimentation control measures.

Erosion and Sedimentation Control Administrative Guidelines

Erosion and Sedimentation Control Plan Review

Recommended Action 1

A procedure should be established to provide for review and approval of erosion and sedimentation control plans by the Engineer in coordination with existing subdivision and site plan review requirements.

Standard Specifications

Recommended Action 1

Standard specifications for both structural and non-structural erosion control measures should be developed.

Erosion and Sedimentation Control Plan Implementation

Recommended Action 1

Certification procedures should be established and implemented to guarantee implementation of approved erosion and sedimentation control plans.

Recommended Action 2

Measures should be developed, such as performance bond requirements, to guarantee implementation of control plans as approved.

Maintenance of Control Measures

Recommended Action 1

Procedures should be developed to provide for adequate maintenance of control measures. These should provide for the transfer of maintenance for permanent control measures from the developer to an appropriate authority or property owner at a designated time following certification of those measures.

Floodproofing and Stormproofing

Standards included within St. Lucie County Ordinance 81-5, Flood Damage Prevention, and Section 30-41 of the Fort Pierce Zoning Ordinance, provide the basis for regulation of land development activities in flood hazard areas. These standards pertain to areas designated by the Federal Insurance Administration (FIA) as areas subject to inundation during storms having a 100-year recurrence interval. They include standards required by the FIA as a condition of local participation in the National Flood Insurance Program.

Currently the approved Flood Insurance Rate Maps for both the City of Fort Pierce and St. Lucie County are being revised to reflect wave height data for the 100-year storm. These revised maps are expected to be released in the fall of 1982. In addition, staff at the regional office of the Flood Insurance Administration are reviewing flood damage prevention ordinances for most of the communities on the east coast of Florida, including St. Lucie County and the City of Fort Pierce. The purpose of these reviews is to consider all aspects of local ordinances, including their implementation. Modification to standards, definitions, procedures, and record-keeping are anticipated as a result of most ordinance reviews.

Floodproofing and Stormproofing Objectives

Recognized objectives of the St. Lucie Flood Damage Prevention Ordinance include:

- Objective 1: To protect human life and health.
- Objective 2: To minimize expenditure of public money for costly flood control projects.
- Objective 3: To minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public.
- Objective 4: To minimize prolonged business disruption.
- Objective 5: To minimize damage to public facilities and utilities such as water and gas mains, electric, telephone and sewer lines, streets and bridges located in floodplains.
- Objective 6: To help maintain a stable tax base by providing for the sound use and development of flood prone areas in such manner as to minimize future flood blight areas.
- Objective 7: To insure that potential home buyers are notified that property is in a flood area.

The City of Fort Pierce flood damage provisions include an additional objective which clearly states that the standards are intended "to ensure that those who occupy areas of special flood hazards assume responsibility for their actions."

These objectives, as presented in the two flood damage prevention ordinances, are consistent with those identified by the Federal Insurance Administration as the objectives of the National Flood Insurance Program.

Floodproofing and Stormproofing Policies

Existing St. Lucie County policies pertaining to floodproofing and stormproofing include:

- Policy 1: River floodplains should remain open to establish more effective water conservation and flood control programs.
- Policy 2: Environmentally sensitive lands and natural wildlife habitats should be protected from land use practices which would disrupt their natural functions and reduce their contributions to the quality of life and economic well-being of the region.
- Policy 3: Homes and other permanent structures should be restricted from special flood hazard areas in compliance with regulations of National Flood Insurance Program.
- Policy 4: Policy determinations and development approvals related to flood protection should be based on current findings by the U.S. Geological Survey for the Federal Flood Insurance Administration and on the methodology of the South Florida Water Management District.

Existing City of Fort Pierce policies pertaining to floodproofing and stormproofing include:

- Policy 1: The City will implement efforts to ensure that the threat to life and property during storms with flooding is minimized, including:
 - Participation in the Federal Flood Insurance Program;
 - Prohibiting construction in areas that are prone to frequent flooding;
 - Development of an emergency evacuation plan for Hutchinson Island which would allow capacity of evacuation routes to enter as a factor in allocating uses for the Island;
 - Promoting construction of a new bridge to South Beach;
 - Promoting reconstruction of dunes to provide natural protection of uses and evacuation routes.

Given the ongoing revisions to the Flood Insurance Rate Maps, as well as recent Flood Insurance Administration recommendations to other communities on the east coast of Florida, both St. Lucie County and Fort Pierce should consider expansion of these policies to explicitly state:

1. In Coastal High Hazard Areas (V Zones), minimum floor elevations of all new structures, with the exception of areas used exclusively for parking, will be required to be above the level of the 100-year wave crest elevation.
2. In Flood Hazard Areas (A Zones), minimum floor elevations of all new structures, with the exception of areas used exclusively for parking will be required to be above the level of the 100-year base flood elevation.
3. In areas of interface between the Coastal High Hazard Area (V Zone) and the Flood Hazard Area (A Zone), minimum floor elevations of all new structures, with the exception of areas used exclusively for parking, will be required to be above the level of the base flood elevation to allow for the forward momentum of breaking waves associated with the 100-year storm.
4. All new construction located in Coastal High Hazard Areas will be required to withstand all applied loads generated by the highest wave forces associated with the 100-year storm.
5. Issuance of building permits for new construction in Coastal High Hazard Areas (V Zones) and Flood Hazard Areas (A Zones) will be dependent upon compliance with floodproofing and stormproofing design requirements.
6. Record surveys by a registered land surveyor or professional engineer will be required to document the as-built elevation of the lowest floor of all new structures, exclusive of parking areas, located in Coastal High Hazard Areas (V Zones) and Flood Hazard Areas (A Zones).
7. Authorities responsible for administration of flood damage prevention standards will coordinate with the Federal Insurance Administration to stay informed of:
 - Modifications to the official Flood Insurance Rate Maps.
 - Modifications to flood insurance rate structures.
 - Advancements in coastal construction and flood hazard mitigation design.

Policy 2 cannot be adopted until the revised wave crest elevations in Coastal High Hazard Areas are finalized. Policy 4 requires adoptions of an upward adjustment of the base flood elevation (see Administrative Guidelines below).

Floodproofing and Stormproofing Development Guidelines

Minimum Floor Elevation

Following completion of the revised Flood Insurance Rate Maps for St. Lucie County and the City of Fort Pierce, flood damage prevention

standards should be modified to comply with the minimum floor elevations as specified in the policies of the preceding section. Specific language modifications to the floodproofing and stormproofing standards of the two ordinances should be obtained from the Federal Insurance Administration.

Minimum Floor Elevation Defined

Existing language used to define minimum floor elevation should be modified to clearly indicate that it applies to the lowest level of floors not used exclusively for parking. Specific language modifications to existing definitions should also be obtained from the Federal Insurance Administration.

Other Modifications to Existing Standards

Federal Insurance Administration review of the existing flood damage prevention ordinances may reveal the need for additional changes. These modifications will be requested so as to provide greater protection to persons and properties in flood hazard areas as well as to provide better rates for persons purchasing flood hazard insurance. These changes should be incorporated into existing ordinances as soon as possible, in accordance with appropriate Federal, State and local procedures.

Floodproofing and Stormproofing Administrative Guidelines

Modifications to be Reviewed/Proposed by the Local Administrator

Recommended Action 1

The appointed local administrator should follow closely all ongoing and planned revisions to Flood Insurance Rate Maps by the Flood Insurance Administration and its consultants.

Recommended Action 2

The appointed local administrator should become familiar with coastal construction and elevated structure design. He/she should stay apprised of innovative design solutions to stormproofing and floodproofing.

Recommended Action 3

The appointed local administrator should stay aware of modifications in the flood insurance rate structure by maintaining contact with the regional office of the Federal Insurance Administration.

Recommended Action 4

The appointed local administrator should assume responsibility for initiating amendments to flood damage prevention provisions.

These amendments should be proposed after consultation with the Federal Insurance Administration and in response to changes in state-of-the-art design solutions to flood hazard problems, changed flood hazard area data, and/or changed flood insurance rate structures.

Building Code Modifications

Recommended Action 1

The local administrator, in conjunction with the community's Engineer and/or other appropriate local official(s), should investigate potential modifications to the Standard Building Code. These modifications should include additional building specifications for construction in Coastal High Hazard Areas (V Zones).

The following publication is suggested as a starting point for identifying building code modifications:

Bureau of Beaches and Shores, Florida Department of Natural Resources. Coastal Construction Building Code Guidelines (Technical Report No. 80-1). November 1980.

Alternative Design Guidelines

Recommended Action 1

A bibliography of acceptable alternative coastal construction design guidelines should be prepared for reference by local developers.

Compliance with Flood Damage Prevention Standards

Recommended Action 1

Strict enforcement of certification and inspection provisions should be implemented. In all instances, as specified in the flood damage prevention regulations, certification of appropriate minimum floor elevations shall be prepared by or under the direct supervision of a registered land surveyor or professional engineer. Such certification should verify the as-built elevation of the specified minimum floor level.

Recommended Action 2

Accurate records should be maintained of all certifications for specified as-built minimum elevations.

Minimum Elevations - Adjustments Upward

Recommended Action 1

Planning considerations for flood-prone areas adopted by the Federal Emergency Management Agency suggest the requirement of additional elevation above the base flood level for all new construction and substantial improvements within Zones A1-30 and V1-30 on the community's Flood Insurance Rate Maps. The purpose of this requirement is to protect against such occurrences as wave wash and floating debris, to provide an added margin of safety against floods having a magnitude greater than the base flood, and to compensate for future urban development.

It is recommended that consideration be given to adjusting the minimum floor elevations for areas designated as Coastal High Hazard Areas (V Zones) and Flood Hazard Areas (A Zones). Particular attention should be directed toward raising the minimum floor areas in interface between Coastal High Hazard Areas (V Zones) and Flood Hazard Areas (A Zones); established 100-year storm elevations for these areas do not consider potential increases in the base flood elevation caused by the forward momentum of breaking waves associated with the 100-year storm.

CHAPTER IX
BEACH ACCESS ANALYSIS

Continued residential and commercial development on St. Lucie County's barrier islands will intensify the need to maintain and improve public beach access points. The additional population, many of whom will not reside on beachfront property, will generate additional demand for beach activity. Also, development along the beach will eliminate opportunities for public access to the beach. Planning for public beach access points must, therefore, occur before development precludes many opportunities.

EXISTING ACCESS POINTS

Seventeen public beach access points are currently identified on the barrier islands, including six on the north island, four in Fort Pierce, and seven on the south island. These are shown on Figure IX-1. The access points on the north island include:

- Avalon Beach Access
- Bryn Mawr Beach Access
- Pepper Park
- Royal Palm Beach Access
- Banyon Road Beach Access
- Fort Pierce Inlet State Recreation Area

These six access points serve a six-mile stretch of shoreline, providing access at an average distance of one mile apart. The maximum distance between access points is 2.2 miles, between Bryn Mawr Beach and Pepper Park.

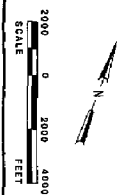
Fort Pierce has beach access points at:

- South Jetty
- South Beach Boardwalk
- Surfside Beach
- Exchange Park

These access points average 0.6 mile apart. The maximum distance between access points is one mile, between Surfside Park and Exchange Park.

Beach access points on the unincorporated south island include:

- Appliance Dump
- Frederick Douglas Park
- Middle Cove Beach Access
- Blind Creek Beach Access
- Herman Bay Beach Access
- Normandy Beach Access
- Moontide/Islandia Beach Access

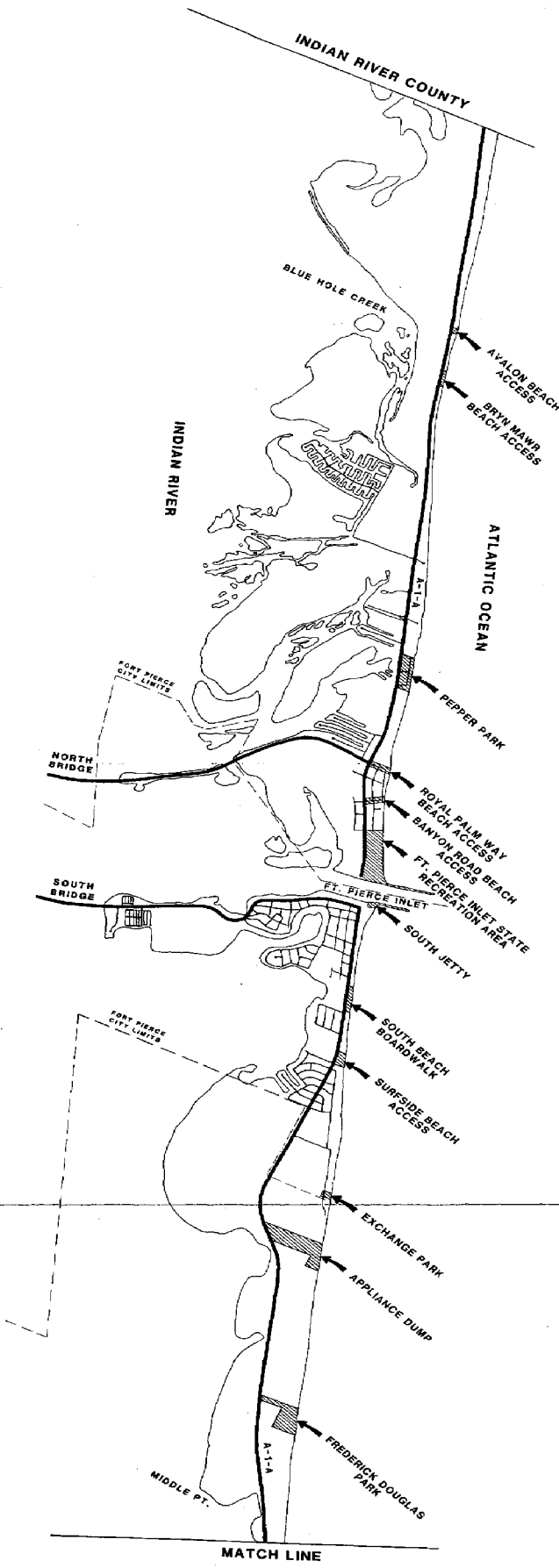
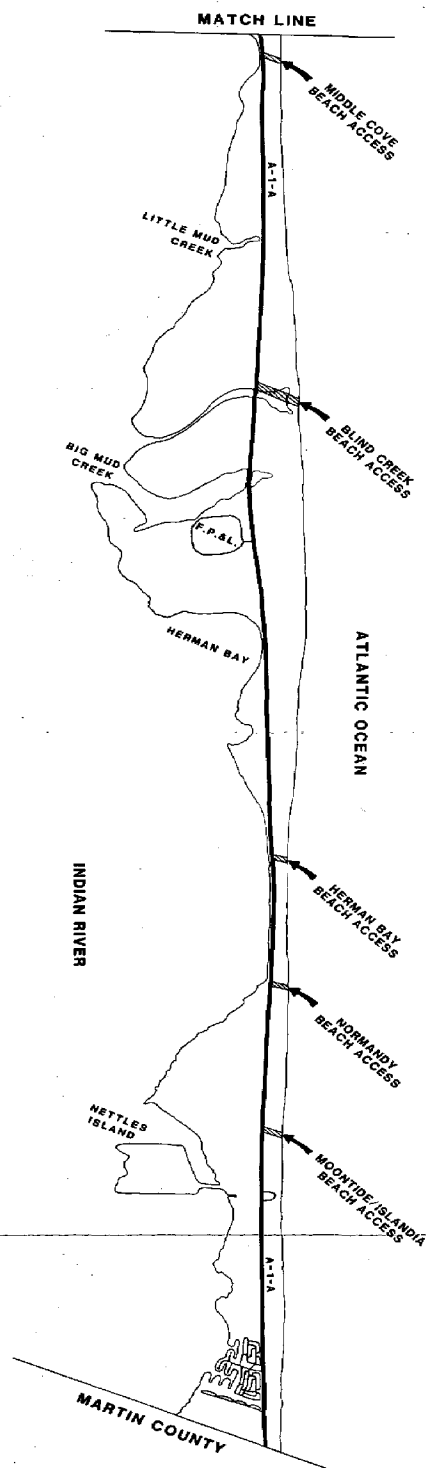


KIMLEY - HORN & ASSOCIATES, INC.
 LINDA M. SPROWING, TERRAN &
 WILSTON, INC.
 WALLACE, ROBERTA, A. TODD
 HAMMER, BILLY & GEORGE

ST. LUCIE COUNTY BARRIER ISLAND STUDY

EXISTING PUBLIC BEACH ACCESS LOCATIONS

FIGURE
 IX-1



These seven access points serve 12.9 miles of beach, providing access at an average of every 1.8 miles. The maximum distance between access points (excluding the FP&L area) is 2.4 miles, between Middle Cove and Blind Creek.

EXISTING POLICY ON ACCESS POINTS

The St. Lucie County GMPP briefly addresses beach access in several places. One of the growth management objectives includes providing "reasonable public access to the water." The plan suggests using dedicated easements to ensure permanent public beach access in residential areas. The recreation/open space guidelines state that "shorelines should be accessible to everyone in the urban area," and suggests using direct land acquisition for that purpose, as well as coastal setbacks and the coastal vegetation ordinance.

NEED FOR BEACH ACCESS

The existing access points appear to provide adequate opportunities for beach access to serve the existing development on the islands and visitors from the mainland. However, as growth continues on the islands, additional public access opportunities will be needed. This need will be especially important under the GMPP and Alternative 1 growth alternatives, because of the high density of development and the likelihood of much of the development not having direct beach access.

It appears that "reasonable" access to the public could be provided by access points spaced at one-mile intervals throughout developed areas of the islands. Using this criterion, two new access points will be needed on the north island, one near the Indian River County line and the other between Bryn Mawr and Pepper Park. New access points will be needed near Little Mud Creek, north of the Herman Bay access, and near the Martin County line on the south island.

As important as, or perhaps more important than, the location of beach access points at regular intervals is the provision of parking at or near those access points. Almost all beach-goers arrive in private vehicles, and the lack of parking constrains beach visitation to the same degree as lack of access. Inadequate parking facilities will leave beach visitors little choice but to park in private development areas or along the road, use non-public access points, or encroach on dunes and other natural areas. The provision of parking at existing or planned public access points will eliminate or greatly reduce these undesired actions.

ALTERNATIVE METHODS OF PROVIDING BEACH ACCESS

Various methods exist for providing public access to beaches. Several of these are described below, with their advantages and disadvantages.

Purchase of Property - The purchase (through negotiation or condemnation) of property fee simple is the most direct way of providing beach access. Purchase of property would give the county the flexibility to make improvements

on the property, such as parking lots, parks or recreation facilities. Economics could be realized through the purchase of a relatively large tract to include public beach with access. Also, a land exchange could be used for the purchase, in place of or in addition to cash. The main disadvantage would be the high cost of purchasing oceanfront property.

Lease of Property - Leasing property for a long period could be significantly less expensive than an outright purchase, particularly in the case of a property owner who does not plan to develop the property in the near future. The disadvantage is that at some time the lease will expire and the property will revert to the owner, unless a new lease is executed.

Purchase or Lease of Easement - The purchase or lease of an easement across a piece of property would give the county (the public) the right to use the property (or a portion) for access without owning or leasing it. Purchase of an easement could be less expensive than purchasing the property, but the county would lack flexibility in the use of the property. It could also be possible to lease an easement for a specified period of time. A lease arrangement for easement would have some of the same advantages and disadvantages as leasing a piece of property.

Dedication of Access - The county could require developers who build in areas designated for future access to dedicate a public access way fee simple as part of the site approval process. The advantage is this method is that access would be obtained without expenditure of county funds. The primary disadvantage is that developers could view the requirement as taking without compensation and could file suit for compensation. The disadvantage could be avoided by granting other concessions (such as density) in exchange for provision of public access by developers. The County would provide the access drive and parking facilities, which could be paid for by user fees. This method would require uniform guidelines that would not place an unfair burden on any particular developer or property owner.

Granting of Positive Easement - Under this method, a developer would still own the land, but would grant a public easement to the county. Such an action could be required, but it could also occur voluntarily because of tax advantages to the property owner. However, liability aspects are unclear, and the granting would only be for a specified period of time. These disadvantages diminish the applicability of this option to the barrier islands.

Of the alternative methods for providing beach access, the dedication option appears most promising. To implement this process, a beach access study should be performed to determine the needs and locations for beach access and related parking. The county will then have to modify its subdivision and site plan review process to include the provision of beach access.

APPENDIX A
COMPARISON OF GMPP ALTERNATIVES

APPENDIX A

COMPARISON OF GMPP ALTERNATIVES

Subsequent to the analyses of the selected alternatives for this study, the St. Lucie Board of County Commissioners requested the evaluation of several additional transportation alternatives in terms of the number of units which could be supported by these alternatives. Table A-1 summarizes the number of units for the analyses contained in the preceding report (existing plus approved, GMPP, A-1, A-2, A-3) plus the three additional alternatives (A-4, A-5, A-6).

The following summarizes the conditions assumed in the various alternatives:

Existing Plus Approved - no bridge improvements.

GMPP - new four-lane bridge at Midway Road, four-lane Jensen Bridge, four-lane north bridge, railroad overpass at north bridge.

A-1 - four-lane Jensen Bridge, four-lane north bridge

A-2 - no bridge improvements

A-3 - new four-lane bridge at Walton Road, four-lane Jensen Bridge, four-lane north bridge, railroad overpass at north bridge.

A-4 - four-lane Walton Road, four-lane north bridge, railroad overpass at north bridge.

A-5 - new four-lane new bridge at Midway Road, four-lane north bridge, railroad overpass at north bridge.

A-6 - this alternative was based upon environmental constraints assuming a maximum likely density of 50 units per net buildable acre. Improvements required for this level of development include a new four-lane bridge at Walton Road, four-lane north bridge and railroad overpass at north bridge.

These various conditions are summarized on Table A-1.

The analyses undertaken in determining the number of units which could be developed in the additional alternatives was predicated on the same assumptions and techniques discussed in the transportation section of this report. The following is a comparison of the advantages, disadvantages and opportunities afforded by the various alternatives.

TABLE A-1
COMPARISON OF DEVELOPMENT LEVELS (D.U.'s)
FOR ALTERNATIVE IMPROVEMENTS

EXISTING PLUS APPROVED	GMPP					
	A-1	A-2	A-3	A-4	A-5	A-6
SOUTH ISLAND:						
South of FPL	12,682	6,926	12,682	12,682	8,839	12,682
North of FPL	9,691	1,865	5,991	5,991	9,691	6,939
Fort Pierce	7,255	7,255	6,705	6,705	7,255	7,255
NORTH ISLAND						
	12,329	4,346	12,329	12,329	12,329	11,957

BRIDGE IMPROVEMENT SUMMARY:

ALTERNATIVE	CONDITION					
	New Four-Lane Bridge		Four-Lane		Four-Lane	Railroad
	Midway Road	Walton Road	Jensen Bridge	North Bridge	North Bridge	Overpass
Existing Plus Approved	-	-	-	-	-	-
GMPP	*	-	*	*	*	*
A-1	-	-	*	*	*	*
A-2	-	-	-	-	-	-
A-3	-	*	*	*	*	*
A-4	-	*	-	*	*	*
A-5	*	-	-	*	*	*
A-6	-	*	-	*	*	*

NOTE: A-6 as indicated would require one-way pairing of Seaway Drive and Binney Drive.

Existing Plus Approved

Advantages:

- No new bridge improvements required.
- Cost of other capital improvements can be accommodated by tax revenues from existing plus approved development.

Disadvantages:

- Major limitation on potential growth on the barrier islands.
- Substantial costs may be incurred in transferring private lands to public ownership if property owners cannot develop their property, plus a significant loss of potential tax revenue with land being removed from the tax roll.

GMPP

Advantages:

- Allows for the full development of the Growth Management Policy Plan and the maximum potential development to be realized on the barrier islands.
- Maximizes potential ad valorem tax revenues.

Disadvantages:

- Requires significantly more capital investment than available from ad valorem tax revenues.
- Requires a new Indian River bridge crossing which may not be permitted due to environmental restrictions.
- Requires widening of Jensen Causeway which may not be permittable and which has major terminal problems at the east end of the Causeway.
- Requires widening of the north bridge which may not be permittable.

A-1

Advantages:

- Permits significantly more development on the barrier islands than is provided for in existing plus approved development.
- Does not require a new bridge crossing of the Indian River.

Disadvantages:

- Depends upon improvements to Jensen Causeway which may be difficult to implement due to terminal problems at the east end of the Causeway.
- Requires four-laning of north bridge which may not be environmentally permittable.

A-2

Advantages:

- No major capital improvements required for bridge crossings.
- Allows some increase in approvable units above the existing plus approved level.

Disadvantages:

- Significantly limits potential development on the barrier islands.
- May require public investment in purchase of private land.

A-3

Advantages:

- Provides for opportunity of full development of south island, south of FP&L and full development of the north island.

Disadvantages:

- Reduces potential development on the south island, north of FP&L and in the City of Fort Pierce, unless Seaway Drive and Binney Drive are operated as a one-way pair.
- Capital investments significantly exceed ad valorem tax revenues available to fund such expenditures.

A-4

Advantages:

- Allows the same level of development as A-3 without the widening of Jensen Causeway.
- Reduces the capital costs for the alternative.

Disadvantages:

- May result in congestion at Jensen Causeway.
- Some significant out-of-direction travel would be required for residents in Zone S-1 and S-2 to travel to destinations south and west of those zones via the Walton Road Bridge. (Jensen Causeway Bridge will have insufficient capacity to accommodate all travel demands, i.e., trips desired by some residents in Zone S-1 and S-2 via the Jensen Causeway Bridge will be required to be made via the Walton Road Bridge in order to avoid congestion.)

A-5

Advantages:

- Allows for the full development of the GMPP north of FP&L in the City of Fort Pierce and on the north island.
- Reduces total capital cost required for capital improvements.

Disadvantages:

- Significantly limits potential development opportunities in Zones S-1 and S-2.
- Requires any trips from S-3 to divert from the Jensen Causeway to the midway bridge to avoid significant congestion.
- Limits potential development on the south part of the south barrier island.

A-6

Advantages:

- This alternative was developed to reflect the amount of development which is likely considering the net buildable acreage given the proposed environmental guidelines. Various transportation improvements could serve this alternative, however, it would include the construction of a new bridge crossing such as the one at Walton Road. Further, four-laning of the north bridge and the railroad overpass at the north bridge would also be required, therefore, the advantages and disadvantages of this alternative are virtually the same as indicated for A-4.

CONCLUSIONS

There would be no reason to adopt the existing plus approved level since A-2 can be accommodated with no major bridge improvements. A-5 is an undesirable alternative since providing a new bridge crossing at the Midway location without improving the Jensen Causeway would tend to overburden the Jensen Causeway.

Although there are major problems associated with the widening of the Jensen Causeway, it would appear that the most likely alternative to be implemented would be A-1, which only requires widening of existing bridges. If the County determines that it is feasible or in the County's best interest to participate in the improvement of Jensen Causeway, then Alternative A-#, which provides for a new crossing at the Walton Road location would be more desirable than a location at Midway Road. The general basis for selecting an alternative would, therefore, be as follows:

GMPP or Alternative A-3 - for full development of the Growth Management Policy Plan.

Alternative A-4 - if the Jensen Causeway cannot be improved and policy dictates that the value of the indicated level of development is an acceptable trade-off for some increased trip lengths and the somewhat increased congestion on the Jensen Causeway.

Alternative A-1 - if no new bridge crossings can be accommodated.

Alternative A-2 - if no bridge improvements can be accommodated.

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